COLUMBIA LIBRARIES OFFSITE
HEALTH SCIENCES STANDARD
HX00049840
RECAP

SERIAL

Columbia University
in the City of New York

COLLEGE OF
PHYSICIANS AND SURGEONS
LIBRARY

COLUMBIA UNIVERSITY
THE
LIBRARIES
IN THE CITY OF NEW YORK
HEALTH
SCIENCES
LIBRARY

Digitized by the Internet Archive
in 2010 with funding from
Open Knowledge Commons

http://www.archive.org/details/transactionsofsi02inte

SIXTH INTERNATIONAL CONGRESS ON TUBERCULOSIS

IN SIX VOLUMES

VOLUME TWO

PROCEEDINGS OF SECTION III
Surgery and Orthopedics

PROCEEDINGS OF SECTION IV
Tuberculosis in Children

Surgical
T
6th 19
V. 2

WASHINGTON, D. C.
SEPTEMBER 28 TO OCTOBER 5, 1908

SIXTH
INTERNATIONAL CONGRESS
ON TUBERCULOSIS

IN SIX VOLUMES

VOLUME TWO

PROCEEDINGS OF SECTION III
Surgery and Orthopedics

PROCEEDINGS OF SECTION IV
Tuberculosis in Children

WASHINGTON, D. C.
SEPTEMBER 28 TO OCTOBER 5, 1908

Transactions

of the

Sixth International Congress on Tuberculosis.

WASHINGTON, SEPTEMBER 28 TO OCTOBER 5, 1908.

WITH AN ACCOUNT AND CATALOGUE OF THE TUBERCULOSIS EXHIBITION,

WASHINGTON, SEPTEMBER 21 TO OCTOBER 12, 1908.

In Six Volumes.

VOLUME TWO.

PROCEEDINGS OF SECTION III,
Surgery and Orthopedics.

PROCEEDINGS OF SECTION IV,
Tuberculosis in Infancy.

Philadelphia:
WILLIAM F. FELL COMPANY
1908.

hel stv
EC
307
I6
1908
v.2

EDITED BY THE SECRETARY-GENERAL.

COMMITTEE ON PRINTING AND PUBLICATION.

Dr. Livingston Farrand, Chairman.
Mr. Homer Folks.
Dr. H. R. M. Landis.
Dr. John H. Lowman.
Dr. Marshall L. Price.
Dr. Joseph Walsh.

EDITORIAL COMMITTEE.

The Presidents of the Sections.
Dr. Wm. H. Welch.
Dr. Vincent Y. Bowditch.
Dr. Charles H. Mayo.
Dr. Abraham Jacobi.
Mr. Edward T. Devine.
Surgeon-General Walter Wyman.
Dr. Leonard Pearson.

EXECUTIVE COMMITTEE.

Dr. Lawrence F. Flick.
Dr. Livingston Farrand.
Dr. Joseph Walsh.
Dr. John S. Fulton.

Officers of Section III.

President:

Dr. Charles H. Mayo.

Honorary Presidents:

Dr. Sydney Stephenson, London,
Mr. J. H. Stiles, Edinburgh,
Prof. Sauerbruch, Marburg,
Dr. D. A. Codivilla, Paris,
Dr. A. Jeanne, Rouen,
Dr. Nové Josserand, Lyon,
Dr. Wilhelm Karo, Berlin,
Prof. Henri Hartman, Paris,
Dr. R. W. Philip, Edinburgh,
Dr. G. Von Illyes, Budapest,
Mr. Arbuthnot Lane, London,
Dr. Nathan Raw, Liverpool,
Dr. Simon Von Unterberger, St. Petersburg,
Baron Takaka, Tokyo.

Vice-Presidents:

Dr. Dudley P. Allen,
Dr. Arthur D. Bevan,
Dr. J. A. Blake,
Dr. Edward H. Bradford,
Dr. Joseph D. Bryant,
Dr. Wm. T. Bull,*
Dr. H. L. Burrill,
Dr. Arthur T. Cabot,
Dr. W. H. Carmalt,
Dr. Wm. E. Casselberry,
Dr. J. C. Da Costa,
Dr. D. S. Fairchild,
Dr. John M. T. Finney,
Dr. Fred H. Gerrish,
Dr. A. G. Gerster,
Dr. Virgil P. Gibney,
Dr. William S. Halsted,
Dr. T. W. Huntington,
Dr. G. Ben Johnston,
Dr. W. W. Keen,
Dr. Howard A. Kelly,
Dr. Charles McBurney,
Dr. H. M. McClanahan,
Dr. Andrew J. McCosh,*
Dr. K. A. J. McKenzie,
Dr. Lewis McMurtry,
Dr. Rudolph Matas,
Dr. Willy Meyer,
Dr. John B. Murphy,
Dr. C. B. Nancrede,
Surgeon-Gen. R. M. O'Reilly,
Dr. Roswell Park,
Dr. L. S. Pilcher,
Dr. J. L. Ransohoff,
Dr. M. H. Richardson,
Surgeon-Gen. P. M. Rixey,
Dr. Emmet Rixford,
Dr. W. L. Rodman,
Dr. Nicholas Senn,*
Dr. N. M. Shaffer,
Dr. George E. Shambaugh,
Dr. Lewis A. Stimson,
Dr. W. B. Van Lennep,
Dr. G. Tully Vaughan,
Dr. S. B. Ward,
Dr. J. Collins Warren,
Dr. Stephen H. Weeks,
Dr. J. William White,
Dr. De Forest Willard,
Dr. H. A. Wilson,
Dr. George B. Wood,
Dr. John A. Wyeth,
Dr. Hugh H. Young.

Secretaries:

Dr. Wm. D. Haggard,
Dr. John T. Bottomley.

* Deceased.

Contents of Volume II, Section III.

Page

President's Address 1
Dr. Charles H. Mayo.

The Construction of Hospitals for Tuberculous Patients 5
Mr. Meyer J. Sturm.

Tuberculosis of the Larynx: The Type which is capable of Recovery or "Arrest" and the Principles of Treatment 12
Dr. W. E. Casselberry.

The Ophthalmo-tuberculin Test: A Note on its Value in the Question of Surgical Treatment of Orbital Disease 26
Dr. Charles A. Oliver.

Tuberculosis of the Cornea 29
Dr. Oscar Dodd.

Tubercular Disease of the Middle Ear 35
Dr. Clarence J. Blake.

The Surgical Treatment of Tuberculous Lesions of the Upper Respiratory Tract ... 40
Dr. D. Braden Kyle.

Tuberculosis of the Nose, Mouth, and Pharynx 43
Dr. Harris P. Mosher.

Tuberculosis of the Cervical Lymph Nodes: Report on 275 Cases treated by Radical Extirpation 54
Dr. Charles N. Dowd.

Retroperitoneal Tuberculous Glands and their Relation to Spinal Symptoms 61
Dr. Charles F. Painter.

Surgical Aspects of Tuberculosis of the Lung and Pleura 73
Dr. Samuel Robinson.

Die chirurgische Behandlung der Lungentuberkulose 82
Prof. F. Sauerbruch.

Tubercular Arthritis of the Hip-joint 100
Dr. S. H. Weeks.

The Treatment of Tuberculous Hip Disease by Weight Bearing and Fixation by the Lorenz Short-hip Spica 111
Dr. H. A. Wilson.

Vaccine Therapy in Joint Tuberculosis 117
Dr. Edward H. Ochsner.

Deux Formes particulières d'arthropathies tuberculeuses du genou 126
Dr. Mauclaire.

Immobilization in Tuberculous Arthritis 129
Dr. A. Codivilla.

Page

De l'oblitération des cavités osseuses et articulaires tuberculeuses avec la Pâte de Mosetig..... 140
Dr. Nové-Josserand.

The Value of the Roentgen Method in the Early Recognition of Tuberculosis of Bones and Joints..... 144
Dr. Carl Beck.

Treatment of Hip-joint Disease..... 148
Prof. F. Calot.

Tuberculosis of the Vas, Epididymis, and Testis..... 149
Dr. John B. Walker.

Blasentuberkulose..... 157
Dr. Med. Wilhelm Karo

Tuberculosis of the Bladder..... 165
Dr. Bransford Lewis.

Tuberculosis of the Kidney..... 176
Dr. Arthur D. Bevan.

The Surgical Forms of Intestinal Tuberculosis..... 183
Dr. Henry Hartmann.

Tuberculosis of the Female Generative Organs..... 188
Dr. I. S. Stone.

Tuberculosis of the Peritoneum..... 189
Dr. F. C. Lund.

Surgical Bearings of Tuberculin..... 199
Dr. R. W. Philip.

Tuberculosis of Bones and Joints..... 204
Dr. Edward H. Bradford.

Open-air and Hyperemia Treatment as Powerful Aids in the Management of Complicated Surgical Tuberculosis in Adults..... 212
Dr. Willy Meyer.

The Surgical Treatment of Tuberculous Sinuses and Their Prevention..... 219
Dr. Emil G. Beck.

How the State of Minnesota cares for its Indigent Children suffering from Tuberculosis of the Bones and Joints..... 251
Dr. Arthur J. Gillette.

Open-air Treatment of Surgical Tuberculosis..... 257
Dr. DeForest Willard.

Tuberculosis of the Urinary Tract..... 268
Dr. Thorkild Rovsing.

Tuberculosis of Muscles, Tendons, and Fascia..... 279
Dr. James F. Mitchell.

Tuberculosis of the Stomach, Liver, Gall-bladder, and Pancreas..... 289
Dr. L. W. Hotchkiss.

La cure d'altitude et la cure solaire de la tuberculose chirurgicale..... 301
Dr. Rollier.

The Acute Forms of Abdominal Tuberculosis..... 303
Dr. D. N. Eisendrath.

Page

Rational Spinal Support 311
Dr. Henry W. Frauenthal.

Über die Nierentuberkulose 315
Dr. G. von Illyes.

Über Nierentuberkulose 318
Dr. B. von Rihmer.

A Study on Experimental Tuberculosis of the Testicle 323
Dr. Charles Esmonet.

Tuberculosis of the Breast 346
Dr. William L. Rodman.

Index 707

Contents of Volume II, Section IV.

PAGE

President's Address 355
DR. ABRAHAM JACOBI.

Tuberculosis in Infants: An Analysis of 131 Hospital Cases as regards Family History and Physical Signs, with Remarks upon Prevention and Treatment.. 361
DR. LINNÆUS EDFORD LA FETRA.

Tuberculosis in Children: Particularly with Reference to Tuberculosis of Lymphatic Glands and its Importance in the Invasion and Dissemination of the Disease.. 367
DR. THEODORE SHENNAN.

The Relation of Measles, Whooping-cough, and Influenza to Tuberculosis in Childhood 379
DR. EDGAR P. COPELAND.

On von Pirquet's Cutaneous Tuberculin Test on Children in the First Year of Infancy. 385
PROF. O. MEDIN.

The Opsonic Content of Breast-milk 390
DR. WM. J. BUTLER.

Report of a Case of Miliary Tuberculosis, probably of Bovine Origin, in a Child, aged Four and One-half Months 394
DR. E. M. GREEN AND DR. A. L. KOTZ.

Clinical Manifestations of Tuberculous Meningitis..... 399
DR. D. J. MCCARTHY AND DR. C. A. FIFE.

The Localization of Tuberculosis in Children 417
DR. WOODS HUTCHINSON.

The Distribution of Tuberculous Lesions in Infants and Young Children: A Study Based upon Post-mortem Examinations 423
DR. MARTHA WOLLSTEIN.

Tuberculous Pulmonary Cavities in Infants 434
DR. C. Y. WHITE AND DR. H. C. CARPENTER.

The Relative Frequency of Abdominal Tuberculosis in Childhood in Great Britain and the United States 446
DR. DAVID BOVAIRD, JR.

La péritonite tuberculeuse du nourrisson 454
PROF. M. E. WEILL AND DR. M. PÉHU.

Tuberculosis of the Pericardium in Children 464
DR. JOSEPH S. WALL.

Des albuminuries intermittentes de l'enfance considérées dans leurs relations avec l'hérédité tuberculeuse 473
DR. J. TEISSIER.

Children of the Tuberculous 479
DR. THEODORE B. SACHS.

Page

The Occurrence of Pulmonary Tuberculosis in the Children of Tuberculous Parents. 487
Dr. James A. Miller and Dr. I. Ogden Woodruff

A Clinical Study of the Transmission and Progress of Tuberculosis in Children through Family Association 493
Dr. C. Floyd and Dr. H. I. Bowditch.

Rôle de la contagion humaine dans la tuberculose infantile 503
Dr. J. Comby.

Obstructive Abnormalities of the Nose and Throat: Predisposing Factors to Tuberculosis in School Children 515
Dr. John J. Cronin.

The Placental Transmission of Tuberculosis 524
Dr. Aldred S. Warthin.

De l'air confiné et de la tuberculose 534
M. L'Architecte Augustin Rey.

Higiene Escolar en el Ecuador 537
Dr. M. Jigon Bello.

The Value and Reliability of Calmette's Ophthalmic Reaction to Tuberculin 542
Dr. E. Mather Sill.

The Cutaneous and Ophthalmic Tuberculin Tests in Infants under Twelve Months of Age 547
Dr. Henry L. K. Shaw.

A Report upon One Thousand Tuberculin Tests in Young Children 551
Dr. L. E. Holt.

The Frequency of Tuberculosis in Childhood 559
Dr. C. von Pirquet.

Differential Cutaneous Reaction 568
Dr. Laislaw Detre.

Clinical Observations on the von Pirquet Reaction in Children 569
Dr. Henry Heiman.

Recent Tests in the Diagnosis of Tuberculosis in Children at the New York Post-Graduate Medical School and Hospital 575
Dr. H. D. Chapin and Dr. T. H. Coffin.

An Aid to the Diagnosis of Tuberculosis in Infancy and Childhood by means of the Cutaneous Inoculation of Diluted Tuberculin or Pure Tuberculin (Pirquet Method) 581
Dr. Louis Fischer.

Diagnostic Value of Lumbar Puncture in Acute Tuberculous Meningitis of Children 588
Dr. F. E. Sondern.

An Expeditious Method for the Detection of Tuberculosis among School-children .. 598
Dr. Harlan Shoemaker.

Ein Resolutionsvorschlag 603
Dr. Adolf Bäumel.

The Value of Children's Gardens in Congested Neighborhoods for those Children with a Tendency to Tuberculosis or for those in whom the Disease has been Arrested or Cured 608
Mrs. Henry G. Parsons.

The Open-air School 612
Mrs. Anna Garlin Spencer.

PAGE

Relation of Tuberculosis to Parks and Playgrounds 619
MR. HOWARD BRADSTREET.

The Hygienic and Climatic Prophylaxis of Tuberculosis in Childhood 623
DR. F. L. WACHENHEIM.

Overcoming the Predisposition to Tuberculosis and the Danger from Infection during Childhood 635
DR. S. A. KNOPF.

Oeuvre de la préservation de l'enfance contre la tuberculose Section Lyonnaise 648
DR. EDMOND WEILL.

The Prognosis in Pulmonary Tuberculosis in Children under Fifteen Years of Age .. 652
DR. FRANK A. CRAIG.

Hygiene of the Mouth, Nares, Pharynx, Intestines, Skin, Mucous Membrane in General Lymph Bodies, Lungs; The Prevention of Colds 671
DR. NOBLE P. BARNES.

The Expectant Treatment of Pulmonary Tuberculosis—A Contribution from Orthopedic Surgery 676
DR. A. B. JUDSON.

The Seashore and Fresh-air Treatment at Sea Breeze Hospital 682
DR. J. W. BRANNAN.

The Possibility of Avoiding Conspicuous Scar Formation in Softened Tuberculosis of the Cervical Glands 703
DR. WILLY MEYER.

Index 711

SECTION III.

Surgery and Orthopedics.

FIRST DAY.

Monday, September 28, 1908.

PRESIDENT'S ADDRESS. HOSPITAL CONSTRUCTION. TUBERCULOSIS OF THE LARYNX. OPHTHALMO-REACTION IN OPHTHALMIC SURGERY. CORNEAL TUBERCULOSIS. TUBERCULOSIS OF THE MIDDLE EAR. SURGERY OF TUBERCULOSIS OF UPPER RESPIRATORY TRACT. TUBERCULOSIS OF NOSE, MOUTH, AND PHARYNX.

The Section was called to order by the President, Dr. Charles H. Mayo, at half past two o'clock. Honorary Presidents of the Section were elected as follows:

Mr. Sydney Stephenson, London
Prof. Sauerbruch, Marburg
Dr. D. A. Codivilla, Bologna
Dr. Nové-Josserand, Lyons
Dr. A. Jeanne, Rouen
Dr. Wilhelm Karo, Berlin
Dr. Henri Hartmann, Paris
Dr. R. W. Philip, Edinburgh
Dr. G. von Illyes, Budapest
Mr. Arbuthnot Lane, London
Dr. Nathan Raw, Liverpool
Mr. J. H. Stiles, Edinburgh
Dr. Simon von Unterberger, St. Petersburg
Baron Takaka, Tokyo

Before taking up the formal program the President addressed the Section as follows:

PRESIDENT'S ADDRESS.

By Charles H. Mayo, A.M., M.D.,
Rochester, Minn.

I am deeply conscious of the importance of my privilege in addressing an audience composed of those who are associated in the work of this great International Congress on Tuberculosis. In accepting the appointment as president of the Surgical Section, I not only assumed responsibility for the success of the Section, but I enlisted in a common cause with the pro-

fessional men of all nations who are striving to suppress, or at least to alleviate, the suffering caused by this most dreadful of scourges, tuberculosis.

The general public still look upon the disease as one affecting the lungs, knowing but little of its varied manifestations. As men representing the surgical methods in the treatment of disease, and dealing with localized tuberculosis, it devolves upon us to consider it from the preventive, preservative, and reconstructive standpoint.

Tuberculosis is a disease which affects the majority of civilized people at some time during their lives. As but 10 per cent. of the population die of it, we have a right to say that few serious diseases, not self-limited, tend more naturally to ultimate recovery than does tuberculosis. It is this tendency which renders it so much more favorable than malignant disease, that those afflicted may be comforted with that greatest of all human blessings—hope. In fact, the disease of itself seldom destroys life, except through the effects of mixed infections. Tuberculosis of the meninges may prove fatal without the aid of other germs; and yet advances in brain surgery show that it may be possible to give relief even in this condition.

It is most unfortunate that tuberculosis is so prone to affect the young and the middle-aged, during the productive period of life. For an adult to become dependent upon sympathy or aid of any kind—be it medicine, crutch, or unearned money—is a serious matter. To be physically sick is bad enough, but is not to be compared with that lamentable condition—the mental disability of the chronic invalid.

While medicine is a science, in many particulars it cannot be exact, so baffling are the varying results of varying conditions of human life. There is still much discussion in the profession, as well as among the laity, as to the manner in which the infection enters the body—whether through the skin, or the respiratory or alimentary tract—and how long it may lie dormant before manifesting its usual signs. Some distinguished investigators have encouraged the public to disregard the danger of infection from animals. One might say, in a general way, that it would be better to consider several sources of infection as possible (which is our present belief) than to neglect any of the accepted preventive measures; since at best it is a difficult matter to attain high standards of practical hygiene.

Infections of all kinds develop toxins peculiar to themselves which cause the blood to produce anti-bodies. It is by means of this reaction of the blood against toxin that we secure our varied vaccines. Many individuals have a high resistance against tuberculous infection; there are many, however, in whom the blood fails to develop the reaction which would cause the tubercle bacilli to be destroyed, thrown off, or even walled in, as usually occurs in common infections.

While we review the various methods of treatment which represent our heritage from the past for the so-called "cure" of tuberculosis, it is well that our attention should be directed to the future, with its sanguine hope. The failures of the past have fulfilled their mission in the progress of investigation, and possibly we should not call them failures.

The disease is many-sided. Medicine still holds first place in its treatment, but more and more, as time passes, the physician's plan of treatment in cases of tuberculosis includes various directions, which mean nothing more than the observance of simple methods of correct living. We are witnessing extensive experimentation in the endeavor to develop a higher resistance to the disease. In the animal world the results are extremely gratifying.

Serum-therapy is again claiming wide attention, notwithstanding its many failures in the past; while the use of filtrates and attenuated living tubercle bacilli have many advocates who report success. In certain forms of joint tuberculosis, these serums and vaccines have a distinct value. Their use offers no difficulty, and they are at least more promising than the various non-specific injections which are used in the hope of developing better repair than can be accomplished by the patient unaided, or aided only by general hygienic treatment.

Surgeons have learned that pure tuberculous accumulations must not be removed without great care to prevent mixed infection. By many failures, we have learned that it may be harmful to operate on local tuberculosis during the acute fever of recent infections, and that the treatment along general lines must make good progress before repair by surgery can be expected. Through failure to recognize such unfavorable conditions, ill-timed operation often results in a rapidly disseminating general tuberculosis.

So each plan of treatment has its application in some type of tuberculosis, though the seeming strife among the advocates of various methods leads the public to believe that we are disagreeing among ourselves. The ability to consider all the circumstances, and select the best method of treatment for the individual patient, and the tact and skill with which the treatment is carried out, determine the results of surgical intervention, and, according to these results, surgeons are graded.

In these days we are admitting the general public to share fully in all we know about tuberculosis, and this publicity has developed a strong sentiment which will improve our legislation on foods, especially meat and milk, and will strengthen other sanitary legislation. The era of a national bureau of public health is now approaching. Publicity on this subject has brought about improvements in the care of sleeping cars, has greatly diminished the evil of expectoration in public places, and has extended to the

farm, where serious efforts are made to exterminate and to prevent tuberculosis among animals. In some communities a morbid fear of the consumptive has arisen, and, while this adds to the burdens of affliction, it is, perhaps, unavoidable; it will pass away in time, and, on the whole, it is undoubtedly for the public good, tending toward the ultimate control of the disease.

THE CONSTRUCTION OF HOSPITALS FOR TUBERCULOUS PATIENTS.

By Meyer J. Sturm, B.S.,
Chicago, Ill.

Hospitals for surgical tuberculosis are in general the same in construction and maintenance of the buildings as hospitals for general surgical cases.

The special features of construction and equipment of such hospitals must be given attention, inasmuch as heretofore nothing along this line has been done to any appreciable extent except in hospitals which have been erected for general surgical and medical purposes, where makeshifts were employed to bring about as nearly an ideal condition as was possible under the circumstances.

The general conditions pertaining to the construction and maintenance of hospitals for the treatment of tuberculous cases, whether these are in surgical tuberculosis or in medical tuberculosis, are the same; namely, that there should be sufficient air and sunlight, nourishing diet, and the facilities for tranquillity of mind and an abundance of rest.

These can be obtained practically in the ordinary manner, except that provision should be made for a maximum supply of fresh air at all times and the admission of a flood of sunlight. This would in no way interfere with the incorporation of the special features which are necessary. The locations of such hospitals should be chosen with this in view. The special features may be summarized as follows:

1. An abundance of sunlight.
2. Absence of noise.
3. Absence of dust.
4. Absence of smoke.
5. Proper ventilation.
6. Disposition of sewage.
7. Safety from fire.
8. Possibility of future expansion.
9. Accessibility for patients, their friends, and for the medical staff.

The general principles which apply to the planning and construction of all hospitals apply equally well to those for surgical tuberculosis; namely,

first, that there should be compactness; second, a maximum of specific requirements of construction with the least cost; and, third, the maximum efficiency of maintenance with the least possible cost, so as to benefit the greatest number with the least expenditure.

The first can be obtained by building superimposed stories, so that all plumbing, wiring, and heating, as well as the constructive parts of the hospital, can be installed in the simplest forms. This will give the required compactness for efficiency, ease, and economy of maintenance.

The outline laid before you here is admirably adapted to the country branch hospital, which is coming so much into vogue, but this paper is written with the fact in mind that in most cases of surgical tuberculosis it is those who have not the means who require treatment most frequently; and if such hospitals were built within easy traveling distance from the homes of these people, they would serve their purpose to much better advantage, because the relatives of those who are being treated can much more readily keep in touch with the patients. This is often the deciding factor where such persons go to the hospital for treatment.

Moreover, this is practically unavoidable, because it is necessary to make a close study of family life, for, as Dr. Taylor so ably says, "The hospital work itself cannot be conducted intelligently without some knowledge of home conditions in each case." There should be an out-patient department, so that those who have gone from the hospital when they are able to do so, and who still need treatment, can get this treatment readily.

In the planning of such hospitals large windows must be provided, preferably of the Dutch door type or of the French window type, so that beds can be moved from the room into the air. It is not possible to have porches entirely surrounding the building, because such porches, owing to the width which would be necessary in order to place beds upon them, would cut off entirely the sunlight from the rooms; and, moreover, such an extent of porch would be neither an economy nor a necessity.

An arrangement should be made whereby one very large window would be left free to admit the sunlight, so that the patient could be moved into a sheltered part of the room, and these porches should then be made common to two rooms on another window or door from each of these rooms respectively. These porches should be artistic in design, and form an integral part of the general architectural scheme; in other words, they should be ornamental as well as useful.

The best form of plan for such buildings is to place at the south large sun-parlors which have direct access upon special solariums in the form of large porches. These hospitals could be planned either in the simple form or straightway plan, in L-shape or U-shape form, and this idea readily embodied.

If a straight plan be used with the rooms or wards on the right and left of a corridor running north and south, giving all rooms either east or west sunlight, the porches on both these sides will receive the morning and afternoon sun respectively in the same manner as the rooms to east and west.

To the north and south, especially the latter, these solariums should be placed; those at the north need not be as large as those at the south. The south porch should lead directly from the large sun-parlor on each floor through French windows. This sun-parlor can well be made the entire width of the building on each floor, so that it will receive sunlight practically all day. There should be large windows to the east and west in this room, as well as to the south. All these windows should be of such pattern that the entire room can be made practically open, and be screened for summer use.

If the hospital be designed in the L-shaped plan, this would apply as well, but instead of having the sun-porches on the north and south wing only, additional porches should be placed on the east and west wing facing south, unless the building be at such an angle that the porches face southeast and southwest.

In the U-shaped hospital the parallel wings should have sun-porches precisely like those in the straight plan hospitals, with the addition of those in the large court between the two wings.

The building should be equipped with large elevators running from the basement continuously through to the level of the roof, of sufficient size and capacity to carry one or even two beds, so that the beds can be taken to the roof. All doors in the hospital should be made sufficiently wide to permit the moving in and out of beds.

In designing hospitals along these lines, this has been quite successful, especially where part of the roof has been equipped with gas-pipe standards and horizontal bars, so that an awning could be stretched over part of the roof, for the protection of the patients from the direct rays of the sun on hot days, and also that there may be no inconvenience to patients during inclement weather.

A division should be made on such a roof by erecting either a canvas partition or a partition of other material, about six feet in height, leaving a space of a foot or eighteen inches at the bottom, so that the male and female patients can be separated.

Large canvas reclining chairs and benches should be put on the roof. There should also be running filtered water. Fully equipped toilet-rooms and a service room, with space and equipment for the bed-pans and other paraphernalia required, should be provided, just as they are on the floor of an ordinary hospital. Besides this general equipment, there should be placed in this service room a blanket warmer. There should be good stout

canvas screens with heavy bases, so they cannot be blown over. These screens should be placed on rollers, so that they can readily be put around a bed in cases where the services of a nurse are required.

Cots and beds, where it is possible, should be left on the roof or on the special balconies winter and summer. Where this is not expedient, the open window into the room is admirable.

The first floor shall be elevated above the grade, so as to get light into the basement, but the elevator is to have a landing stage on the level of the ground, so that wheel-carts and wheel-stretchers, and for that matter beds, can be run out upon the lawns.

In addition to the stairways, there should be a gradual incline or runway from floor to floor, so that wheel-chairs and wheel-stretchers can be readily taken up and down these, or, in cases where it is possible, the patients can wheel themselves from floor to floor and in and out of the building.

The hospital itself must be so constructed that, while a patient is under surgical or mechanical treatment, the windows can be kept open continually, these windows to be of the type which can be either raised or lowered and swung out at an angle, much as an awning would be swung out, so that they could be kept open continually.

This type of window is operated much like a transom, except that it can be lowered into grooves, so that in its natural position it runs like an ordinary window, and can be raised and lowered as such.

Dr. Taylor says, in referring to this, that "the patients should be provided with hoods, wrappers, comforters, and screens, and that the windows should be kept continually open. The nurses should wear sweaters, and the temperature of the rooms in cool months should not rise above 60° in the daytime and 50° at night; they should preferably be much colder."

All such hospitals are necessarily to be constructed fireproof, and their equipment is to contain, besides the special apparatus for the treatment of tuberculous cases, the special sterilizers for bed-pans, urinal cans, and small and large cuspidors on each floor and in roof service rooms.

The toilet and service rooms are to be separated; that is to say, the bathing facilities and water-closets are not to be in the same room as the slop-hoppers, slop-sink, bed-pan sterilizers, and the special bed-pan racks, broom closet, and preparation table, which are to be provided in each such room.

These rooms are to be placed on either side of a shaft running the full depth of both of the rooms, making the space between the two rooms about three feet. By doing this a continuous duct is formed for the reception of all the plumbing pipes and wires, which are in this way easily accessible, and also will make room for from two to four spacious ventilating ducts, which

can be operated merely by putting a gas-burner or a small radiator at the foot of each duct, and running these ducts continuously from basement to six to ten feet above the roof, with a hood to keep out rain over each. Forced ventilation can be installed to operate these ducts.

In the equipment of bath-rooms all tubs are to stand free, so that the nurse can walk entirely around the tubs. The tubs should be solid to the floor, with no space underneath. Water-closets are to be fastened to the wall and free from the floor. Provision is to be made for portable tub service, namely, the water-supplies and waste necessary for this type of tub. The lavatories or sinks, so far as possible, if put into the toilet-room, are to be placed on brackets, and the supplies run to the walls. These lavatories should invariably take the form of a sink into which can be placed separate wash-basins, so that these basins can be kept clean and sterile, racks or hooks being provided for hanging these basins over the lavatories.

The equipment of the main kitchen, which is to be placed on the top floor, is the same as that for kitchens in general hospitals. In each of the special and ordinary diet-kitchens there is to be a large table with racks under for the reception and setting up of the food trays. There will be in each such diet-kitchen a small steam table with a combination gas-stove, the entire base of this steam table being a plate-warmer.

Instead of having the dishes washed in each diet-kitchen, there is to be a fully equipped dish-washing room, preferably in the basement, connected with all diet-kitchens and main kitchens by a food-lift and small dumb-waiter. This room is to contain at least two sinks for the washing of egg-cups and such dishes as have to be washed by hand, and two small sinks for the washing and rinsing of glassware, and a mechanical dish-washer in which the dishes are washed and cleaned by boiling water and live steam.

If, in a six-story hospital, there is one special diet and a general kitchen, besides the diet-kitchens on each floor, instead of having the crews necessary to do the dish-washing in each kitchen, one crew or possibly two can do the washing for the entire institution, and the dishes can be distributed very easily with this arrangement.

By placing the kitchen on the top floor and equipping this, as well as the diet-kitchens, as described, it is possible to serve all food hot and palatable at all times. The added advantage of having the kitchen on the top floor is the fact that it can be more adequately ventilated and lighted than it can in any other location in the building. This eliminates the attendant odors entirely from the hospital, as they naturally arise even with the best ventilating systems, for during the warmer months the windows are open in both kitchen and rooms above the kitchen, and thus the odors permeate the entire building.

There are to be sufficient private rooms in all such hospitals, depending

upon the size of the institution, and the scope of the work, and the demand for such rooms. The wards are all to be small—preferably from four to six beds. These small wards are especially valuable in hospitals connected with medical schools, as one or more of these wards can be regularly assigned to senior and junior students for a definite period of time.

In these wards the patients are not distributed, because there can be a better selection of cases, namely, acute surgical cases can all be placed in small wards, while those who are convalescing will not be disturbed, because they are placed in other small wards. Moreover, if there is a preponderance of male patients over female patients, or vice versa, there is more elasticity in the small ward, owing to the fact that if there is only one male or one female patient, and a great number of female or male patients respectively, an entire large ward need not be given over to this one patient, whereas the other ward would be crowded. It is very important in hospitals to have all the floors so arranged that each floor contains only private rooms or only wards, because private rooms and wards on the same floor invariably give rise to endless annoyance.

There should be in such a hospital the customary electric signal system for calling nurses, preferably of the type which calls by electric light over the doors, this being positive and quiet and having no bells which are continually ringing and disturbing patients. It has been found to be the most economical of all systems in installation and operation, as it takes only the ordinary electric light circuit with the special relays, with pilot lights and extension pilots.

The operating department is practically the same as for ordinary hospitals in plan and equipment, and is to be placed on the top floor, so that it can be well lighted and ventilated, and so that the noise will not disturb the patients in the building.

The floors in such a hospital should be of one of the monolithic types now on the market, which are becoming more successful. These floors are all to have cove bases.

The walls and ceilings of such hospitals should have cement plaster with slight coves at all angles, as a matter of cleanliness and not that there is any danger of lodgment of germs. All these walls should be treated with a solution and given two or three coats of good paint or enamel. All paints to have dull finish, to be obtained in the paint and not by stippling.

The general equipment, such as vacuum-cleaning systems, which are advocated especially in hospitals of this character, as well as the general arrangement aside from that described, is practically uniform with other classes of hospital buildings.

DISCUSSION.

Dr. Francis W. Gallagher (El Paso, Texas): It would be better, if possible, to have separate hospitals for surgical tuberculosis, and in such an event I know of no arrangement which would more fully answer the requirements than the detail presented to the Congress by Mr. Sturm. Private philanthropy may supply such institutions in two or three of the largest centers of population, but, for the present at least, the tuberculosis surgical cases will have to be cared for in institutions devoted to the tuberculous, or else in the surgical wards of our general hospitals. The former would be the preferable plan. The hospital, as distinguished from the open-country sanatorium, must necessarily be so constructed as to accommodate many patients under a single roof, and the plan proposed by Mr. Sturm utilizes, to the best advantage, the roof and porch room. The high cost of ground space makes the multiple story necessary, and a building too far from the center of business life precludes largely the attendance of the doctors more actively engaged, in this as in other departments of professional work, and this is necessary as a general proposition for the best results. There can be little doubt that the man in touch with the world of medicine outside of the hospital would exert the greatest influence for good within the hospital. All other things being equal, there can be no doubt of the superior advantage of the open-country sanatorium, and this situated away from contaminating influences of the city, and in a climate where the air is largely germ-free and low in humidity, and with other conditions which permit living out of doors day and night.

TUBERCULOSIS OF THE LARYNX:

THE TYPE WHICH IS CAPABLE OF RECOVERY OR "ARREST," AND THE PRINCIPLES OF TREATMENT.

By W. E. Casselberry, M.D.,

Professor Emeritus of Laryngology and Rhinology in Northwestern University Medical School, Chicago.

I. The Non-resistant Type.—On the principle that an overpowering though often erroneous impression is produced by tragic events, our common conception of tuberculosis of the larynx is drawn from its harrowing course in about two-fifths of the cases which, collectively, for contrast, I designate the non-resistant type, and which is characterized by a speedy development, persistent progress, and rapidly fatal termination. Out of a total of 60 cases of private record, these qualities pertained to a group of 24, or 40 per cent., in all of whom death ensued in less than an average of one year from first observation, and in less than two years from the first-remembered symptom of the laryngeal complication. A classical laryngeal image of the disease is presented in Fig. 1, sketched from nature in the person of one of this group.

It will not, therefore, seem inappropriate, as the argument proceeds, that tuberculosis of the larynx which has proved capable of healing or "arrest" should be designated as a type, for, while Heryng, Krause, and Lake have dwelt upon its surgical curability in isolated instances, I seek to establish for laryngeal tuberculosis what is now well known with respect to the pulmonary affection, the fact that, in certain patients, nature develops an adequate resistance, self-sufficient to "arrest" the disease, and that in certain other patients nature develops an almost but not quite adequate resistance, which, when persistently reinforced by the best methods of our art, then suffices to arrest the disease.

II. The Hopefully Resistant Type.—Twenty-two in number, or two-fifths of the total series, compose a second group in which the laryngeal tuberculosis ran a much slower course, the natural resistance of the patient having been sufficient to effect temporary amelioration and arrest, but usually in the end having fallen short of permanent arrest. Of this number, 8 are accurately known to have succumbed, but only after from three to seven years, and 12, when last observed, were obviously doomed, also

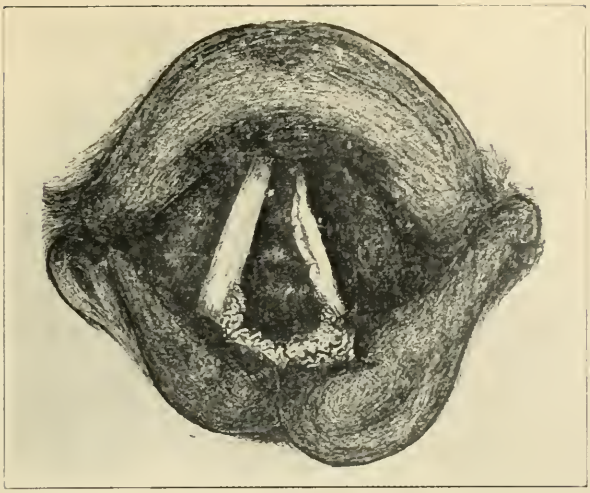


Fig. 1.—A classical image of tuberculosis of the larynx. Miss A. C. Non-resistant type.

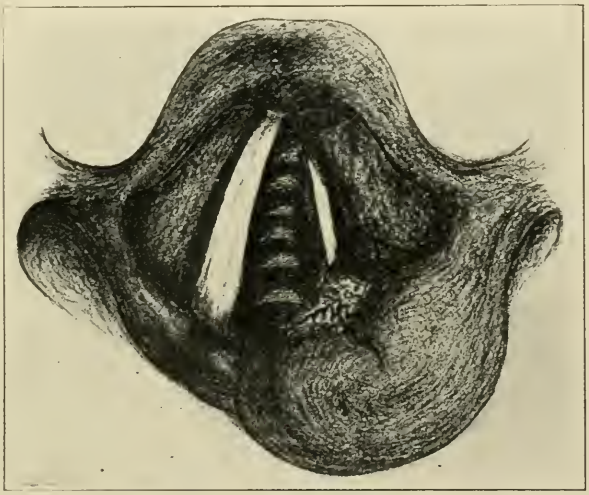


Fig. 2.—Chronic hyperplastic tuberculosis of the larynx of five years' duration. Mr. E. Z. Hopefully resistant type, now in the eighth year, and almost but not quite "arrested."

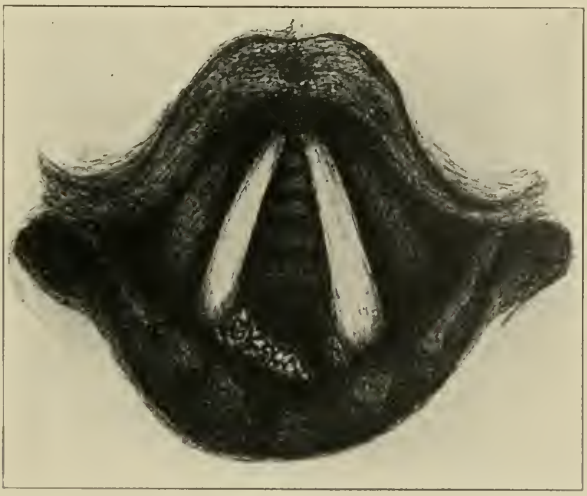


Fig. 5.—Tuberculosis of the larynx. Case of Mr. R. A. L. nine years ago. Now and for eight years past in a state of "arrest."

having survived through their own inherent resistance, with but desultory aid, for from three to seven years. This brings the mortality of the entire series to 80 per cent.; but the cloud is not without its silver lining, for, in addition to the third group, that of permanent arrests which will take up the other 20 per cent., there remain two cases of this second group which, by aid of modern methods and suitable habits of life, have now almost, if not quite, reached a state of permanent arrest. The condition of the larynx in one of these as sketched at its worst, nearly three years ago, is shown in Fig. 2, in which, bearing upon the diagnosis, it should be observed by comparison that, aside from a unilateral predominance, the lesions are identical in kind with those in Fig. 1, which in turn was selected from the non-resistant type to represent the classical aspect of tuberculosis of the larynx.

The pyriform swelling of the arytenoid is the same in kind, although greater in degree; it blends in like manner with another swelling of the inter-arytenoid fold, and blends also with a diffused hyperplasia of the ventricular band. In the angle formed by the attachment of the posterior end of the left vocal cord there is the same sort of flexion fissure with eroded surface, from which sprout equally characteristic granulomata. The patient, Mr. E. Z., then aged forty-four, had first noticed, five and a half years previously, a persistent cough with expectoration, which was followed in four months by a hemorrhage, and within two years by laryngeal pain on swallowing. His well-nourished appearance, to quote the patient's own phrase, "seemed to belie his disease," and this, together with the unilateral predominance of the lesions in the larynx, which, however, I have observed in the proportion of 1 to 15, suggested unusual care in the diagnosis. The apex of the right lung gave signs of a limited tuberculous deposit. Bacilli were "present, a few to a field"; histological guinea-pig test was positive. Also, the tuberculin test was positive. Weight, 131 pounds, representing a loss of 8 pounds; pulse, 80 to 100; temperature, 97° to 99° F. Under treatment at the end of a year (the sixth year of the disease) the laryngeal hyperplasia had diminished; the granulomatous fissure had become merely an irregular crease in a somewhat redundant tissue; the voice resumed fair service, and the pain on swallowing had faded to a vague sense of "something there," and with a gain of 16 pounds, his ratio of weight to height was in excess. At present, in the eighth year of the disease, although the laryngeal hyperplasia is still evident, its inactivity, as judged by the lapse of time, with absence of ulceration and freedom from pain or irritation, indicates a state of retrogression approaching, but not yet to be classed quite as, a permanent "arrest."

III. Successfully Resistant Type or Type Capable of Arrest.—A third group is composed of 11 cases, or nearly 20 per cent. of the series,

in which the laryngeal tuberculous lesions are or were in a state of arrest after the lapse of periods varying from four to fourteen years. It is not meant that all of them recovered permanently from every phase of tuberculosis, for the very fact that at length some of them have died of tuberculosis of the lungs or other organs will be cited in evidence that the laryngeal complication, during its course, was of the same nature; but it is meant by the term "arrest," that for a number of years all progression in the larynx has been interrupted and retrogression established, as indicated by the cicatrization of the ulcers, if any, the gradual lessening of hyperplasia, and the cessation of subjective pain and irritation. In order to be fully credited, an allegation of recovery or even "arrest" from laryngeal tuberculosis must be supported in a manner to overcome both a natural contention of possibility of error in diagnosis and an innate doubt of the permanence of such an "arrest," for it is true that syphilis of the larynx or other tractable condition is liable, exceptionally, to be mistaken for or to coexist with tuberculosis, and true, also, that no period of years is an absolute guarantee against recurrence. Therefore the pertinent features of the cases of this group will be summarized in a manner designed to render competent the evidence, when taken as a whole, even though the future should alter the logic of events with respect to certain of the details.

Four of the patients have been under my own inspection at various periods both before and after the "arrest." Persons of this type are able to travel far and wide, so that when information at first hand, based on the recorded results of competent examination of the larynx by one and the same observer both before and after "arrest" is available, and is reasonably conclusive in detail, it should go far toward satisfying any doubt of the existence in reality of a tuberculosis of the larynx originally, and toward justifying the use of the term "arrest" as a description in truth of the present state. It so happens, however, that two of them—the two perhaps of most importance—have also been examined both during and after the "arrest" by Dr. Gildea, of Colorado Springs, whose reports cover the intervening periods and bring the records up to date.

No one would doubt the tuberculous nature of the laryngeal lesions in the first of these, which I will illustrate in Fig. 3 as sketched from nature in January, 1901. The mammillated hyperplasia of the interarytenoid fold, the granulomatous proliferation around the vocal process, the flexion fissure at the angle of junction of the cord and arytenoid, the mouse-nibbled ulceration about the fissure, and the pyriform swelling of the arytenoids, form together a picture which is absolutely characteristic of the disease. It concerned the Rev. J. W. D., who was then twenty-seven years of age, having had pulmonary tuberculosis previously for three years, and the laryngeal complication for about one year. He proved suitable for surgical treat-

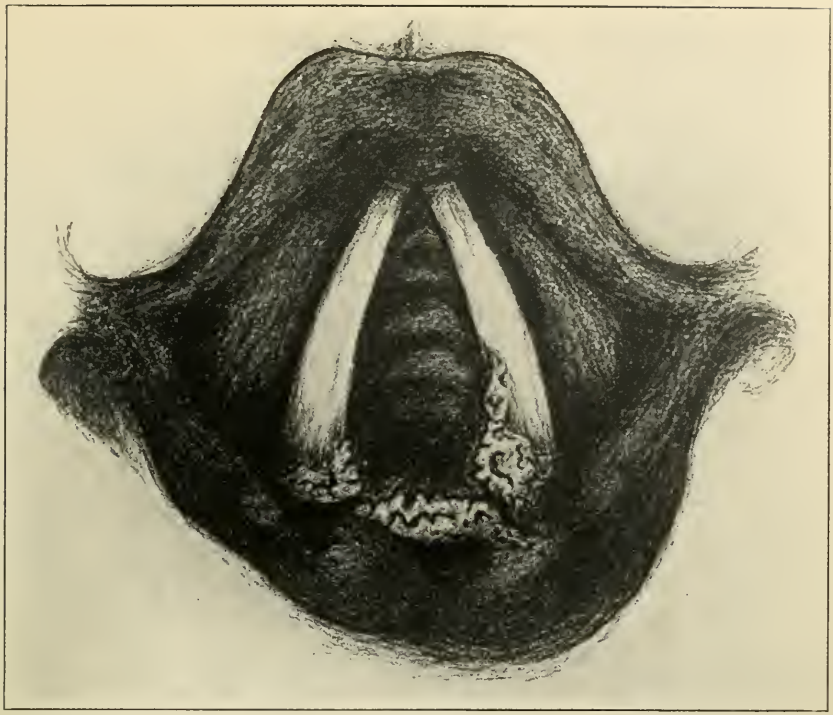


Fig. 3.—Case of the Rev. J. W. D. eight years ago. Tuberculosis of the larynx in its second year. Now and for five and one-half years in a state of "arrest," as shown in the next figure.

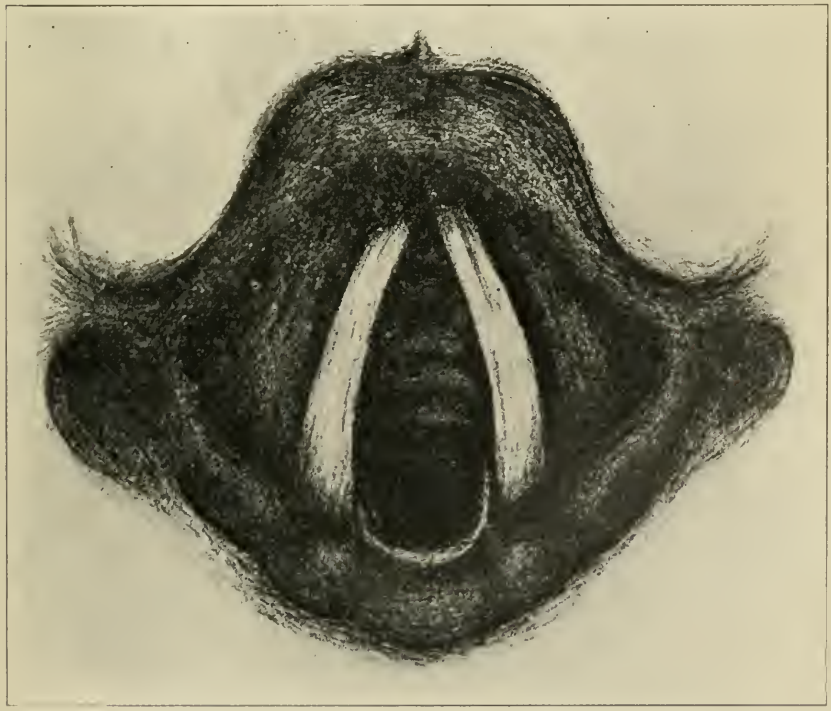


Fig. 4.—Case of the Rev. J. W. D. Now in a state of "arrest," and showing a smooth scar. Compare with Fig. 3.

ment, and received seven thorough excisions or curettements, one each month, supplemented by lactic acid frictions running up to 90 per cent. in strength. It is specifically recorded of the fourth curettement that it was directed to the remains of the fissure and adjoining ulceration, and again recorded, at the completion of the local treatment, that the granulomatous hyperplasia had been mostly removed, and that all broken and ulcerated surfaces were healed. Of course, some deeply seated infiltration remained, but even its retrogression dates from this treatment, at the conclusion of which a change of climate to the Rocky Mountain region favored the improvement, which went steadily on. A year later Dr. Gildea reported: "All activity in his throat has ceased." "Voice fairly clear." At the end of six years Mr. D. himself reported: "The larynx has been well for four years." "Voice fairly strong." Now, at the end of eight years, Dr. Gildea again reports: "Although much fibrosis in the lungs and a few tubercle bacilli are found, the larynx is absolutely well, the voice being clear and good and the arytenoids normal," and Dr. Gildea has made a sketch of the larynx, which I reproduce in Fig. 4, exhibiting the present smooth, pearly-white, and healed appearance of the same site which is shown in the previous figure to have been so characteristically tuberculous eight years ago. A comparison of the two pictures demonstrates that not merely an "arrest," but an actual recovery, so far as concerns his tuberculosis in the larynx, has taken place. To recapitulate:

The time from the beginning of the pulmonary tuberculosis is eleven years.

The time from the beginning of the laryngeal tuberculosis is nine years.

The duration of "arrest" of the laryngeal tuberculosis, with the patient living at this date, is five and a half years.

Equally characteristic are the tuberculous lesions depicted in Fig. 5, as sketched from nature in the person of Mr. R. A. L. in February, 1900. Again, the granulomatous infiltration centers about the vocal process or point of junction of the vocal cord with the arytenoid, which is a favorite site in the larynx for the initial infiltration. A similar flexion fissure is seen to be forming in the pyriform swelling of the arytenoid, but it is as yet without definite ulceration. The conspicuous infiltration of the right side of the epiglottis is shown as embracing also the pharyngo-epiglottic fold, and dotted under its surface, having been plainly visible in the image, more so than in the illustration, were many individual tubercles. By reason of this condition of the epiglottis, which already caused pain in swallowing, I then regarded the prognosis as unfavorable, although in other respects it was hopeful. He was then thirty-nine years of age, having had slowly developing apical pulmonary tuberculosis for six years, and the laryngeal complication for one year, the bacilli present being few in number. Weight, 155; pulse, 120. His local treatment, by curettement and lactic acid, I directed especially to

the granulomatous focus around the vocal process, which improved under it. The change of climate after some months was first to the Rocky Mountain region, and on his return in January, 1901, I was quite surprised to observe that the laryngeal infiltration had disappeared, a fact which I find recorded in these words: "Infiltration of epiglottis not now discernible, and no pain whatever in swallowing. Weight, 196; pulse still 120; lungs in statu quo." At my third and fourth observations, in August, 1901 and 1902, the larynx remained equally well and the lungs had improved. He lived next in southern California, whence Dr. Radebon, in 1907, reported him as living in good health, and being now in Colorado again, Dr. Gildea reports that his larynx remains well. To summarize:

The time from the beginning of the pulmonary tuberculosis is fourteen years.

The time from the beginning of the laryngeal tuberculosis is nine years.

The duration of the "arrest" of the laryngeal tuberculosis is eight years, and he is living at this date.

Mr. P., aged forty-five in 1901, had diffused infiltration of two years' duration at favorite sites in the larynx, but without definite ulceration; copious expectoration with many tubercle bacilli, evident pulmonary signs, and a positive tuberculin reaction. The absence of a corresponding degree of emaciation led to particular care in diagnosis. He was made a test case for the *x*-ray treatment, which, although it failed in subsequent cases, seemed decidedly beneficial to him, and he received within six months no less than 48 exposures, after which, on special examination for the purpose, I recorded: "Larynx undoubtedly better, but not well. Infiltration much less; voice improved—his friends commenting on it." During the next eight months he received only fresh-air treatment, after which was noted, "continued reduction of the hyperplasia," and after two years, on examination, his laryngeal tuberculosis I recorded as "arrested," "with only residual hyperplasia remaining." At the end of seven years he writes from Iowa, where he has reëntered employment, saying, "I have further improved, only slight hoarseness and occasional coughing remain." To recapitulate:

The time from the beginning of the laryngeal tuberculosis is nine years.

The duration of the "arrest" is five years, and he is living at this date.

Mr. W., aged twenty-three in 1893, had typically tuberculous laryngeal infiltration of the left vocal process and adjoining parts of the arytenoid angle and fold, of six months' duration, dating from vocal impairment, and had also tuberculous cervical adenitis and evident pulmonary disease.

Business requirements caused his treatment for several months to be limited to antiseptic and emollient local applications, but afterward he changed to an outside occupation in the far West. On his return, five years

later, the larynx showed a mere residuum of the former tuberculous infiltration, and up to the end of seven years he had remained well. Recapitulating:

The time from the beginning of the laryngeal tuberculosis up to the period of last information is eight years.

The unknown duration of the "arrest" is five years, and he is probably living at this date.

In Cases V and VI the condition before the "arrest" is known through examination by the author, but the opinion that an "arrest" of the tuberculous process in the larynx has since occurred, is necessarily based on written reports by the patients, stating that they are now, after many years, living and subjectively well with respect to the larynx.

Mr. P. P. was sent to Saranac Sanitarium in 1901, whence Dr. Fremley transmits a copy of the record, which not only confirms the diagnosis, but indicates that his tuberculosis of the larynx grew worse for some months, the epiglottis and arytenoid being described as considerably enlarged, the infiltration previously having been limited to the vocal processes and interarytenoid fold. He received tuberculin R in minute doses, but the "arrest" culminated only after subsequent prolonged open-air living in the West.

The time since the beginning of the laryngeal tuberculosis is nine years.

The duration of the "arrest" is seven years, and he is living at this date.

Mrs. O. P. A. resorted at once to the open life by removal to the West, receiving no other treatment. The infiltration had been distinct, but limited to the vocal cords. She reports annually.

The duration of the "arrest" is four years, and she is living at this date.

In the next group of five cases the evidence is complete with reference to the final "arrest," but not quite so respecting the first diagnosis, the author's observations having been limited to the periods after the arrest; but I was able to observe the residual hyperplasia and a few small scars and depressions in the tissue left by the ulceration. None of them ever suffered any relapse in the larynx, but they died of the underlying pulmonary tuberculosis at the length of four, five, nine, ten, and eleven years, respectively, after an "arrest" of the laryngeal complication had taken place, its date having been fixed by the cessation of symptoms and the statements of former physicians, some of whom were able to certify also to the original diagnosis. The only doubt would concern the possible coexistence of syphilis in the larynx, a combination which would be unusual in so large a proportion of cases. An additional case is purposely excluded, although tuberculous in the larynx and lungs, for the reason that the breadth of scar tissue and its site at the borders of the epiglottis did suggest a possible coexisting syphilis, notwithstanding the history and physical signs were those of tuberculosis. It is obvious, therefore, that I have not been unmindful of the fact, recently stated anew by Grünwald, that "Confusion with tertiary ulceration, and still more with syphilitic infiltration and perichondritis, is to be feared, even

hemorrhage being not rarely an early symptom of the tertiary infiltration of the mucous membranes," but I believe this ancient error has not been permitted to vitiate the value of this group of "arrests."

Mr. B., examined in 1895, the laryngeal disease being then of two years' duration, and already in a state approaching arrest. There was residual interarytenoid hyperplasia and cicatricial indentation of one cord, representing a loss of substance from ulceration, which had healed. He had already regained his voice, and was able thereafter, for nine years, to use it as teacher in a school of acting.

The time from the beginning of the pulmonary tuberculosis was eleven years. The duration of the "arrest" of the laryngeal tuberculosis was nine years to date of death.

Mr. Fred B., of Texas, when examined in 1893, had infiltration of the arytenoids and fold, the disease being then in a state approaching arrest. His son, answering my inquiry, states that the throat remained well until death ensued from tuberculosis of the bladder, seven years afterward.

The duration of the "arrest" was seven years to date of death.

Mr. C., examined in 1894, had multiple small cicatricial indentations of one ventricular band, the ulcers having healed. No recurrence in the larynx during a period of five years, up to the time of his demise from an acute relapse of an old-standing evident pulmonary tuberculosis. Verification by Dr. Staples, of Dubuque, who had persistently treated the laryngeal ulcerations with menthol in olive oil during two years until they were healed.

The duration of the "arrest" was five years to date of death.

In 1891, while on a visit in New Mexico, I examined Mr. S., an active business man, whose sallow complexion and sepulchral voice had attracted my notice, and who was pointed out to me as a marvelous climatic recovery, then of eleven years' standing, from laryngopulmonary tuberculosis. The examination, which he courteously permitted, left no doubt that the still perceptible but healed distortion of the larynx represented a former tuberculosis in a state of "arrest." He died some years later, but without having suffered any recurrence in the larynx.

The duration of the "arrest" was at least fifteen years to date of death.

Miss W. exhibited at first only a pair of typical "singers' nodes," doubtless due to forcing the voice in kindergarten work, during that period of enfeeblement of the larynx which is common to initial tuberculosis, inasmuch as six months later there was present a characteristic tuberculous hyperplasia of the ventricular band, a pyriform swelling of one arytenoid, and pain on swallowing. But at this stage, notwithstanding the disease in the lungs subsequently progressed to a fatal issue within five years, all further development in the larynx ceased under the influence of a year's life in the open air, and retrogression took place to the degree that all subjective symptoms referable to the larynx subsided permanently.

The duration of the "arrest" was four years to the date of death.

Local Treatment.—The treatment of tuberculosis of the larynx is a chapter of deep gloom in medicine, and its surgical treatment after two decades of indiscriminate application stands to-day in little better repute; but the foregoing analysis shows that the prognosis is not so absolutely bad,

and it indicates that if the malady be early recognized in all its seriousness, and persistently but wisely managed with respect to the type, the results will be far better. To paraphrase a previous statement, so general is our misconception, based on the rapidly fatal course in the non-resistant type (two-fifths), that I was myself surprised and encouraged on counting up as many as 20 per cent. of recoveries or "arrests" (one-fifth), aside from the many others of an inherently hopeful type (two-fifths).

Intralaryngeal surgical treatments were made in several, but particularly in the two indubitable cases depicted in Figs. 3–5, in each of which an "arrest" with retrogression followed to a degree most striking and complete. The treatments consisted of excision of circumscribed infiltrations by punch forceps, and of sharp curettage of granulomatous and ulcerated areas, methods which require special skill and selection of cases, but which, in the resistant types, for lesions which are reasonably accessible and not too diffused nor too deeply seated, are capable, in isolated instances, of inaugurating recovery or prolonging life. Likewise the abscission of a tuberculous epiglottis is a beneficent measure, if only for the removal of an agonizing impediment to the swallowing of food. On the other hand, to attempt any of these methods in patients of the non-resistant type is but to court opprobrium and to invite disaster.

Although the type be suitable, lest the way be opened to mixed infection and disintegration thereby hastened, one should hesitate to sever, by operation, a previously unbroken, moderately smooth surface, which overlies a diffused tuberculous infiltration. Such a condition, for instance, as is represented in Fig. 2, in which I refrained, for this reason, from excising even a fragment for microscopical examination. However, I feel little hesitation in primarily breaking through a granulomatous, vegetating or papillomatous surface which surmounts a moderately circumscribed infiltration.

The method by galvanocautery deep punctures I have long employed, but usually only for exceptional reasons, but it is now being earnestly advocated by experienced operators* as the most generally applicable, far-reaching, and efficient of minor surgical means. In two patients in whom I repeatedly applied it with thoroughness, one for a pronounced interarytenoid infiltration amounting almost to a tumor, the other for diffused hyperplasia, the escharotic loss of substance after each slough had separated, would appear itself to be of small extent, but it had the advantage of reaching deeply into the infected structures, and the inflammatory reactions, although not very severe, seemed to exert an absorbent effect on the tuberculous hyperplasia throughout an area extending considerably beyond that of the actual caustic destruction. Both of them made temporary "arrests," but

*Grünwald, "Die Therapie der Kehlkopf Tuberculosis," Lehmann's Verlog, München, 1907.

subsequently passed from my observation, hence are not among those above enumerated in that class.

At the end of a course of surgical treatment, whether by galvanocautery or cutting instruments, it should be realized that minor areas of residual hyperplasia will still remain, and some deeply seated foci of infection survive, so that a relapse is to be expected unless increased resistance is cultivated, preferably by life in the open air, with all thereby implied, which, in the 20 per cent. of "arrests" described, exerted a powerful curative influence.

Lactic acid, 10 to 90 per cent., applied by cotton friction, and *creosote* by submucous injection, being somewhat escharotic in their effects, may be classed with surgical methods as requiring discrimination in use. Lactic acid tends to heal ulceration, and it is an adjuvant to curettage, a practical individual test of its efficacy being a reasonable toleration of the painfulness of its application and a prompt amelioration of the painfulness of the disease. At present, formalin, 0.25 to 1 per cent., preferably by a deeply reaching spray, is growing to replace lactic acid, the same test being a useful guide in its use.

Radical External Operations.—Grünwald* collates 73 cases operated upon by European surgeons, access for excision of the diseased parts being in most of them made by laryngofissure, of which 75 per cent. had died within a year or so after the operation, and only 8 per cent. had recovered and remained well for over two years. Nevertheless, in this small number of recoveries were several brilliant ones in which the patient's general condition having been still good, he had faced death from suffocation or inanition, in consequence of laryngeal tumefaction, perichondritis, or ulceration. Tuberculous tumors, in conjunction with other lesions, predominate in this list of recoveries which followed external operations. Such, in brief, are the conditions which, in my opinion, may justify an external operation, while in the absence of urgent laryngeal symptoms or in the presence of advanced lung disease, an external radical operation can be but rarely indicated. Impending suffocation in the presence of advanced lung disease is appropriately met by tracheotomy.

Local medical treatment, although it may seem to have exerted but a minor effect in those cases in which the tuberculous process in the larynx eventually became arrested, nevertheless is always helpful and sometimes is indispensable.

Formalin and lactic acid have already been mentioned as adjuvants to surgical measures. Also, they tend to promote the cicatrization of ulcers, perhaps succeeding brilliantly or again failing utterly, but they have little or no effect on unbroken infiltrations, and as their primary irritation is not

* Loc. cit.

well tolerated in the non-resistant type, it is well, in using either medicament, to abide by the test of its efficacy previously given.

A mentholated emollient spray, containing menthol, 0.25, the oils of eucalyptus and gaultheria, each, 1.00, in yellow vaselin oil, 100.00, is, within limits, a sedative to cough and pain, and is suitable for home use. To it may be added, to exalt its sedative effect, the uncombined alkaloid cocain, 0.1 to 0.2, previously made in solution with olive oil, 5.00 to 10.00, the pure alkaloid being selected because its hydrochlorid is not soluble in fixed oils. For severe cough and pain a mixture of powdered cocain hydrochlorid 0.5, and powdered orthoform 100.00, insufflated in the dose of 0.5 gm. twice daily, affords the greatest relief, provided care be taken that the insufflation reach the interior of the larynx. Cocain, even in this harmlessly minute dose, is unrivaled in momentary effectiveness, but alone is too evanescent, while the sedation by orthoform alone is too mild in degree, but is of several hours' duration. To the mixture of the two may be added, further, codein sulphate, 0.5 to the 100.00. It is unfortunate that skilled service is usually required to insufflate the larynx effectively; when this is not available and self-insufflation fails, orthoform in egg-emulsion, applied by means of a coarse spray or a syringe, ranks next, but is troublesome in use, so I usually substitute for it the mentholated and cocainized oil spray, adding orthoform each time, placed in suspension by shaking.

Systemic Treatment.—In reading before the Surgical Section of the Congress, it was convenient to consider "Systemic Treatment in General" consecutively to the case of E. Z., by which it was exemplified, which accounts for the following somewhat detached but still pertinent references to that case.

Practical experience is still limited with the treatment of laryngeal cases by tuberculin in the minute dose of $\frac{1}{1000}$ milligram, and by other vaccines and sera, the scientific purpose of which is to augment resistance as measured preferably by the opsonic index, but it presents an encouraging outlook, and in the few cases so treated under my observation the tuberculin seemed helpful, in one decidedly so, and in none did it seem in any way detrimental.

In the resistant types, the three cardinal principles, rest, open-air living, and forced feeding, should be even more rigorously enforced than in lung disease alone, as the chance for life is less hopeful. By "rest" should be understood not only rest of the body and mind, but rest to the voice and rest from the exactions of business. Rest is first named because it is of first importance, compliance with the other two cardinal principles being dependent upon it. I have found business the major impediment to home treatment. It takes the courage of conviction to advise the sacrifice of a man's ambition, to say naught of his income, and yet it must be done, or all other efforts, being deemed subservient to business stress, become but

half-way measures; no hours are kept, and no advice followed excepting as business permits. Referring to Mr. E. Z., he was advised to this effect, he made the sacrifice, and reaped his reward in restoration to health and business capacity. Moreover, rest to the voice is so essential that business dictations must be strictly enjoined, and even social conversation should be limited. In the treatment of tuberculosis of any other joint, as, for instance, the knee or hip, immobilization is quite the rule; why not so in the larynx?

It is good management at critical periods, and at some but not all other times, for laryngopulmonary patients to remain where skilful local treatment is available, hence, usually at or near their home city; and this plan becomes more feasible as the knowledge spreads that it is fresh air rather than any particular kind of fresh air which is required, and also more acceptable to patients since the inhospitable legend, "No case of tuberculosis received," is now so commonly found posted at resorts. Nevertheless, in the 20 per cent. of "arrests" which my series affords, it is evident that, following the completion, for a time, of the local treatment, a powerful curative influence was exerted by life in the open air, and as this mode can be carried out with less friction amid sunshine and dryness, I have recommended, at suitable periods, for the resistant types, a resort to favorable climates, giving preference to localities where, when needed, a continuation of local treatment is available, for by means of it the oft-intensified distress of the patient can at least be greatly ameliorated. In fact, as it is impracticable in the long run for two physicians to be retained, it is proper to lay special stress in this connection upon the recommendation that as soon as laryngeal tuberculosis is found to complicate a pulmonary case, the treatment, not alone of the larynx, but of the disease as a whole, should be intrusted to one who is skilled in laryngeal technic, for the laryngeal involvement is the immediate life-threatening factor in the case, and only in this way can the natural resistance of the patient be conserved and the general management of this especially desperate combination, laryngopulmonary tuberculosis, be placed in line with the present wide-spread determination, of which this Congress is an exponent, to moderate the misery and mortality of the great white plague. Referring again to Mr. E. Z., he secured a house with grounds in a near-by suburb, where he fitted up a corner sleeping porch on which, notwithstanding the severity of the winter season at Chicago, he slept out every night throughout the entire year. There were wild nights of wind and storm, but such an extreme limit of night exposure was rather his own choice, and to this extent it is not usually to be commended. Laryngopulmonary patients of the non-resistant type, especially, cannot endure inclement night exposure, as in them it tends, by aggravating the irritability of the larynx, to increase the pain in swallowing, and thus to cut down the nourishment. At first, on sleeping out, even the average cold at night and the early morning damp-

ness quite generally excite coughing spells, but the resistant types soon harden to a reasonable degree of cold, beyond which point discretion is the better part of valor. In conclusion, it has been shown:

1. That tuberculous hyperplasia in the larynx has not infrequently undergone resolution in the whole or in part.

2. That unmistakable tuberculous ulcers have occasionally healed and remained healed.

3. That favorable negative qualities have characterized in common the cases which have proved to be capable of "arrest" or recovery; for instance, the laryngeal hyperplasia has been less progressive, less diffused, and less prone to ulceration; the underlying pulmonary infection has been less extended; there were fewer tubercle bacilli, a lower pulse-rate, and less emaciation.

4. That, these qualities persisting, the cases which are capable, at least, of a hopeful resistance, can be differentiated, thus justifying every effort at any sacrifice to invoke the methods likely to arrest the disease and lead to recovery, including intralaryngeal surgery when the lesions in degree and kind are suitable for it.

5. That, in like manner, the non-resistant type should be recognized, and those patients guarded from the privation and distress which surely follow in the wake of an indiscriminate exposure to the elements and to the hardships of travel in distant climes. In them surgery is contraindicated, excepting to prevent air-hunger and suffocation or to prevent starvation by the removal of some particularly painful impediment in swallowing.

Tuberculosis de la Laringe: Casos Capaces de Recuperar.—(CASSELBERRY.)

Se busca establecer en la tuberculosis de la laringe, lo mismo que se dice existir en la tuberculosis pulmonar: esto es el desarrollo de la resistencia natural, capaz de detener el proceso de la enfermedad; también se expone el hecho de que muchos otros casos ofrecen una resistencia conciderable, más no de un grado suficiente para detener el curso de la afección.

1. Que la hiperplacia tuberculosa de la laringe pude terminar en resolución.

2. Que úlceras tuberculosas de la laringe pueden curarse algunas veces.

3. Que cualidades negativas favorables, las cuales indican una resistencia superior, es característico de los casos capaces de recuperar.

4. Que después de un período razonable de observación, durante el cual estas cualidades persisten, deberá distinguirse los casos capaces de recuperar.

Nuestra concepción común de la tuberculosis de la laringe, se determina por medio del curso de ésta en unas dos quintas partes de los casos; los casos irresistibles. Casi dos quintas partes de los casos constituye un grupo en el cual las complicaciones de la laringe toman un curso más lento, pero siempre fatal. En una quinta parte, las lesiones están en estado estacionario, durante 5 á 6 años. Se hace referencia a los métodos del tratmiento, local y general.

Tuberculose des Kehlkopfes: die der Heilung zugängliche Form derselben und deren Behandlungs-Prinzipien.—(CASSELBERRY.)

Man ist daran, für die Tuberculose des Kehlkopfes dasselbe festzustellen, das man heute mit Bezug auf Lungentuberculose als Thatsache betrachtet, dass sich nämlich in gewissen Individuen eine natürliche Resistenz entwickle, die weiteren Fortschritten des Krankheitsprocesses einen Damm stelle; und dass viele andere eine wohl ganz bedeutende Resistenz entwickeln, die jedoch nicht hinreicht um den Stillstand zu bewirken. Es ist erwiesen:

1. Dass tuberculöse Hyperplasie des Kehlkopfes der Absorption zugänglich ist.
2. Dass unanfechtbar tuberculöse Geschwüre gelegentlich ausheilen.
3. Dass jene Fälle, die sich als heilfähig erwiesen haben, gewöhnlich durch günstige negative Symptome gekennzeichnet sind, welche auf höhere Widerstandskraft und günstigere Aussicht auf Heilung schliessen lassen.
4. Erwiesen sich diese Eigenschaften für eine angemessene Beobachtungsperiode als stabil, so sollte es keine Schwierigkeiten bereiten, die der Heilung zugänglichen Fälle differenzieren zu können.

Die allgemeine Anschauung über die Tuberculose des Kehlkopfes stützt sich auf den vexierenden Verlauf von der zwei Fünftel der Fälle bildenden wiederstandslosen Form. Fast zwei Fünftel der Fälle repräsenteiren eine Gruppe, in welcher die Complication im Kehlkopfe einen viel langsameren, wenn auch schliesslich fatalen Verlauf nahm. In einem Fünftel war seit fünf bis acht Jahren Stillstand eingetreten.

Die anerkannten localen und allgemeinen Behandlungsmethoden finden entsprechende Würdigung.

Tuberculose du Larynx: le Type Susceptible de Guérison.—(CASSELBERRY.)

On cherche à établir pour la tuberculose laryngienne le fait déjà démontré pour la tuberculose pulmonaire; que certaines personnes développent en elles une résistance naturelle, suffisante pour enrayer la maladie,

et qu'un bien plus grand nombre offrent une résistance considérable, à laquelle il ne manque peut-être que le degré requis pour enrayer le mal.

On fait voir:

1. Que l'hyperplasie tuberculeuse dans le larynx est résoluble.
2. Que des ulcères sûrement tuberculeux se cicatrisent parfois.
3. Que les qualités négatives favorables qui accusent une résistance supérieure et annoncent une issue plus heureuse caractérisent communément les cas que l'on sait être susceptibles de guérison.
4. Que, ces qualités persistant après un temps raisonnable d'observation, on devrait pouvoir différencier les cas curables.

Notre idée banale de la tuberculose du larynx est tirée de sa marche navrante dans à peu près deux cinquièmes des cas, le type dépourvu de résistance. Presque deux cinquièmes composent un groupe où la complication laryngienne suit un cours beaucoup plus lent, cependant fatal. Dans l'autre cinquième les lésions sont dans un état d'arrêt, de 5 à 8 ans. Aperçu des méthodes approuvées de traitement local et général.

THE OPHTHALMO-TUBERCULIN TEST:

A NOTE ON ITS VALUE IN THE QUESTION OF SURGICAL TREATMENT OF ORBITAL DISEASE.

By Charles A. Oliver, A.M., M.D.,
Philadelphia.

Within the past six months three cases of localized orbital disease, of uncertain etiology, have been submitted to my judgment as to the advisability of operative procedure. Each was given the benefit of reaction-to-tuberculin studies, with which I have been much occupied of late. The results, in every instance, were those of undoubted positive reaction.

Appropriate tuberculin-therapy was applied in each case, with the result that the signs and the symptoms of the orbital disturbance, in two of them, so greatly subsided, in four and a half months' time and four months' time, respectively, as to have the condition for which the patient came considered as practically well; while the third, which is under active treatment at the present time (June, 1908), is rapidly undergoing local resolution. The health of all of the cases has remarkably improved, and a not long postponed general recovery is expected.

Without entering into a detailed account of the cases in such a brief communication as this, and reserving a full report of them for a more extended article upon the subject, I herewith give the following reasons which induced me to resort to the plan, and offer a few conclusions regarding the usefulness of the method in this particular type of disease.

The reasons, briefly stated, were that, having previously noticed that the ophthalmo-reaction in many of my ophthalmic cases was more pronounced in young, comparatively sthenic subjects, with the less marked and the more uncertain types of tubercular lesions of the corresponding eye and its adnexa, and that such reaction could be obtained with even the largest percentages of reaction material without any damage to the eyeball, I came to the conclusion that in such cases the test must prove itself of value, not only in regard to diagnosis, but in reference to both prognosis and method of therapy.

As a result, I offer the following conclusions in support of the method:

I. Ophthalmo-tuberculin tests, judiciously used, are of value in the determination of tuberculosis of the corresponding eye and its adnexa,

particularly in primary infections of the same, and should be made in every doubtful case.

II. Ophthalmo-tuberculin tests, properly employed in such cases, serve not only for purposes of etiological diagnosis, but are of importance in the determination of methods of treatment for the removal of the local disease.

III. Ophthalmo-tuberculin tests, carefully made, should form a part of the routine study employed in every case of doubtful disease of the eyeball and its adnexa before any proposed operative measures are resorted to.

IV. Ophthalmo-tuberculin tests, conscientiously applied and giving positive determinative results, should, whenever possible, be followed in part or in whole by tuberculin-therapy.

Valor de la Prueba Oftálmica de la Tuberculina en el Tratamiento Quirúrgico de las Enfermedades del Ojo.—(OLIVER.)

Las concluciones son las siguientes:

1. La prueba oftálmica de la tuberculina, cuidadosemente hacha, es de valor en la determinación de la tuberculosis en el ojo correspondiente y sus anexos, particularmente en las infecciones primarias, y deberá hacerse en todos los casos dudosos.

2. La prueba oftálmico de la tuberculina, propiamente empleado, sirve no solamente para el diagnóstico etiológico de la enfermedad, sino qe también es de importancia en la determinación de los métodos del tratamiento en la eliminación de las afecciones locales.

3. Antes de recurir al tratamiento operativo, la prueba oftálmica de la tuberculina deberá constituir una parete de la rutina empleada en los casos de una afección dudosa del ojo y sus anexos.

4. Los casos en los cuales la prueba oftálmica de la tuberculina da una reacción positiva, deben ser seguidos, en parte ó por completo, por el tratamiento de la tuberculina.

La valeur de la réaction ophtalmo-tuberculine dans le traitement chirurgical des maladies orbitaires.—(OLIVER.)

Voici les conclusions proposées:

1. Les réactions ophtalmo-tuberculines, judicieusement employées, sont importantes pour révéler la tuberculose de l'œil correspondant et de ses appendices, surtout dans leurs infections primaires: on devrait s'en servir dans tous les cas douteux.

2. Ces mêmes réactions, convenablement employées dans ces cas-là, non-seulement servent aux besoins du diagnostic étiologique, mais encore aident à choisir les méthodes de traitement pour puérir la maladie locale.

3. Employées avec soin, ces mêmes réactions devraient faire partie des observations routinières de tous les cas douteux de maladies de la prunelle et de ses appendices avant que l'on ne recoure aux moyens opératoires proposés.

4. Les réactions ophtalmo-tuberculines consciencieusement employées et ayant donné des résultats positivement déterminatifs, il faut, toutes les fois qu'on le peut, appliquer en tout ou en partie la thérapie tuberculine.

Ueber den Werth der Ophthalmo-Tuberculin-Probe in der chirurgischen Behandlung von Erkrankungen der Augenhöhle.—(Oliver.)

Autor kommt zu den nachstehenden Schlussfolgerungen:

1. Ophthalmo-Tuberculin-Proben, wenn mit Discrimination angewandt, bewähren sich in der Diagnose von Tuberculose des betreffenden Auges und dessen Adnexa, namentlich in Fällen von Primär-Infection, und sollten in zweifelhaften Fällen stets angewandt werden.

2. Ophthalmo-Tuberculin-Proben, wenn in solchen Fällen richtig angewandt, dienen nicht blos zur Aufklärung der Aetiologie der Erkrankung, sondern sind auch von Wichtigkeit in Bestimmung des gegen die Ausrottung der Localerkrankung gerichteten Heilverfahrens.

3. Bei Erkrankungen des Augapfels und dessen Adnexe zweifelhaften Characters sollten Ophthalmo-Tuberculin-Proben stets schalblonenmässig angewandt werden, bevor zu chirurgischen Massnahmen geschritten wird.

4. Fälle, in welchen Ophthalmo-Tuberculin-Proben, richtig angewandt, von positivem Ergebnisse begleitet sind, sollten, wenn möglich, stets theilweise oder durchgehend mit Tuberculin behandelt werden.

TUBERCULOSIS OF THE CORNEA.

By Oscar Dodd, M.D.,
Chicago.

It is only within a short time that tubercular conditions of the eye have been recognized, especially those forms which occur with a latent general tuberculosis. Undoubtedly, the number would be much larger if we examined more carefully many of the obscure cases of chronic inflammation of the iris, ciliary body, and choroid. The diagnosis has been practically impossible unless some part could be removed for culture or injection. Fortunately, at present we have in tuberculin injections a safe and comparatively sure method of diagnosis.

My reason for considering tuberculosis of the cornea is that it presents a unique clinical picture in having the lesions in a transparent, non-vascular structure, allowing of careful observation of its progress and the effect of treatment. In studying the cases I find that the changes apparent in the cornea are as sensitive to treatment as the opsonic index.

A few primary cases have been observed from direct infection after slight injuries of the corneal epithelium, but most frequently it occurs by extension from the surrounding parts or by endogenous infection from foci in other parts of the body.

Stock, by his experiments on rabbits, has shown how this may occur. By injecting tubercle bacilli into the veins of the ear he obtained foci in the choroid, ciliary body, and iris. Instead of increasing rapidly in size and finally destroying the eye, as happens when bacilli are introduced directly into the anterior chamber, it was found that these lesions, as a rule, underwent spontaneous healing. In the internal organs of all the animals, however, typical caseating tubercles occurred. He attributed the mild character of the lesions largely to the fact that the bacilli were confined to the blood-vessels, and thus exerted less toxic action on the tissues, and to the special nutrition and resistance of the eyeball. This seems very doubtful considering the susceptibility of the eye to other poisons.

The foci in the anterior part of the eye are more likely to persist than those farther back. A large focus could exist in the ciliary body without giving any symptoms of cyclitis. He was never able to demonstrate the tubercle bacilli in the lesions, although he did not doubt their presence.

In a more recent article he describes an experiment which seems, without doubt, to demonstrate their presence. From the iris of an animal in which the lesions were apparently completely healed he removed a piece of the tissue and introduced it into the anterior chamber of a healthy rabbit. In the latter it gave rise to the typical caseating form of tuberculosis. This also illustrates the fact that tubercle bacilli or spores may remain dormant in lesions which are apparently healed for long intervals, and may then become active upon stimulation.

Two general types of the disease are seen: (*a*) That of a general parenchymatous keratitis, and (*b*) that of a sclerosing keratitis in which the process extends from the corneal margin into the deep corneal tissue.

(*a*) The general haziness of the first type is explained as due to the toxins produced by a tubercular inflammation of the uveal tract. Usually, when the haziness clears up, a number of spots are seen throughout the deeper layers of the cornea. The vascularity is usually much less than occurs with the luetic form.

Enslin, upon testing 24 cases of interstitial keratitis, found 8 which reacted to tuberculin. Of these, 5 had tuberculosis or a predisposition to it, and 3 had symptoms both of tuberculosis and of lues.

(*b*) The sclerosing form I believe to be more common and typical of tuberculosis. The corneal infiltration is usually preceded by swellings near the corneal margin, which resemble phlyctenular inflammation very closely. These vary in extent from one or two spots to practically surrounding the whole cornea. Verhoeff believes they are typical of tuberculosis, as he found them present in all his cases of scleritis which gave a local as well as a general reaction to tuberculin. Microscopically, he found that they were typical tubercle foci consisting of epithelioid with occasional giant-cells surrounded by lymphoid and plasma cells. He noted their variation in appearance, as they seemed to come and go at intervals of a few days. This is probably due to the surrounding edema, which varies with the activity of the tubercle bacilli. They are of the same nature as the spots in the cornea as found by others.

The corneal infiltration begins at these places and extends toward the center, usually in a triangular form. There are a number of discrete, yellowish-white spots, resembling broken-down tissue, surrounded by more or less general haziness. A few blood-vessels are seen in the deeper layers extending into these foci, but the vascularity is never very marked. The surface of the cornea may have the roughened, stippled appearance of an ordinary interstitial keratitis, but is frequently unchanged.

The eye has more or less general inflammation, with the symptoms of a cyclitis. The deposits on the posterior surface of the cornea, when present, are large and resemble fat-drops. In some instances invasion of the cornea has been noted from these deposits.

Occasionally the uveitis is of a plastic form. In one of my cases there was complete adhesion of the iris to the lens, and the pupil was filled with exudate.

The course of the disease is a decidedly chronic one, for while in the more vascular parts of the eye there is a tendency to healing by the encapsulation of the foci, in the cornea they will exist for months. New foci will appear and old ones slowly be absorbed. Ordinary treatment apparently has little effect upon the process, although it may quiet the inflammation and irritation.

In a case shown by Dr. Wilder before the Chicago Ophthalmological Society the deposits in one cornea cleared up under general treatment. Six months later it began in the other eye, and grew much worse under treatment until tuberculin was used, when recovery took place.

In my cases I used the old tuberculin in a medium-sized dose for diagnostic purposes. It was followed by a local as well as general reaction. The new Koch tuberculin (T. R.) was used in increasing doses for treatment under opsonic control, never giving it when the opsonic index was low. Very slight local reaction was obtained except when too large a dose was given. In one of my cases the dose was increased too rapidly, and it was followed by marked infiltration into the cornea, with some new foci showing. The eye was considerably inflamed, and it took several days before it cleared sufficiently to allow further treatment.

The improvement was very noticeable from the tuberculin treatment, the general inflammation subsiding and the spots in the cornea disappearing, leaving scarcely a trace of their former location.

As to its method of action, judging from the observation of those cases, it seemed to be by the increased vascularity and greater supply of lymph-cells about the foci. With this occurred the increased ability to destroy the bacilli, as shown by the higher opsonic index. This action can be increased, as has been frequently pointed out, by good food, fresh air, etc., which should also be considered in the treatment.

I will briefly report two private cases which I have had under treatment:

A girl, aged fourteen, came to me in October, 1906, giving a history of having had inflammation of the right eye for about three weeks. She was well developed and apparently in good health, but rather anemic. Her family history was good. There was a marked swelling at the corneal margin of the right eye, and some infiltration in the cornea. The eye was painful and very sensitive to light. The left eye was somewhat inflamed, with two small spots of infiltration at the corneal margin. I considered the case one of phlyctenular inflammation, and sent her to the hospital to be treated as such. It grew much worse, and some iritic adhesions formed. By the last of November the swelling and irritation had subsided somewhat. In the deep corneal tissue were a number of small, sharply defined spots of

infiltration, looking like broken-down tissue, and some vascularity passing from the margin into these spots. She was taken with diphtheria, and I did not see her until the last of December. The condition was then about the same, the eye fairly quiet under atropin, but would congest easily. During her first stay in the hospital she had no rise in temperature at any time during the day. I had her return to the hospital again on January 10th and her temperature taken frequently for several days, but found it perfectly normal. Her opsonic index was taken on three succeeding days, and found below normal. We then gave her a diagnostic dose of 5 mg. of old tuberculin, and twenty-six hours later got the maximum reaction. Her temperature was $102\frac{1}{5}°$, pulse 120, and she complained of severe headache, some nausea, and pains in her body. This began to subside in two hours, and on the following day her temperature was normal. The local reaction was very marked, the eye became much inflamed, and about the foci, which were previously sharply defined and distinct, there was a large amount of general infiltration and an increased vascularity. At the temporal side a new focus became visible, in which the sharply defined spots showed later. The general haziness resulting from this injection did not clear up for several days. About ten days later, her opsonic index having risen to normal, an injection of Koch's new tuberculin (T. R.) was given, which gave some local reaction. Six days later she was given a larger dose of tuberculin, and two days later her opsonic index was considerably reduced, and she complained of some pain in her knees, which may have been the result of the injection. This was followed by marked irritation of the eye, which did not subside for several days. I was careful after this not to have too large a dose of the tuberculin given, and did not have the troublesome reaction again. She was given about twelve injections altogether, the last one about three months after beginning the treatment.

The corneal infiltration disappeared, so it was hardly apparent, a little haziness remaining only at the site of the denser infiltrations. Her vision became about normal.

One of the most marked things during her treatment was the improvement in the general condition; her color was greatly improved, and her weight increased several pounds.

This case illustrates well the effect of tuberculin treatment in these cases. While the use was controlled by the opsonic examination, yet the corneal condition was a good indication of the care necessary in its use. Whenever a large dose was given, the infiltration into the cornea was noticeably increased, and the congestion of the eye more marked.

In another case the general condition did not improve, as in the first, as there was a great amount of glandular infection; but the tuberculin treatment brought about a practical cure of the ocular inflammation.

A boy, nine years old, came to me in December, 1907, giving the history of trouble with his eyes, and having been treated for interstitial keratitis for several months with no benefit. He was a small anemic child, no larger than he should have been at six. His sight was very poor, the left eye being practically blind. Both eyes were greatly inflamed, with great photophobia.

The right cornea was hazy and vascular, the iris adherent to the lens, but some red reflex could be gotten. The cornea of the left eye was quite opaque, with considerable vascularity, and in the central part were some white spots, looking like calcareous degeneration. The pupil was entirely filled with exudate, and the iris completely adherent. I sent him to the hospital for treatment. He had an increase of temperature every afternoon, which usually did not exeeed 99.2°. His opsonic index was generally low, but varied greatly. He was given general tonics and small injections of new tuberculin (T. R.) with atropin and dionin in the eyes. His eyes and general condition improved steadily, but the afternoon rise in temperature still continued. The corneæ cleared almost completely, and the inflammation and irritation of the eyes subsided so that he was able to see very well with the right eye. He had some tubercular cervical glands which he was advised to have removed, but the family would not consent, and he was taken home about April 1st. The improvement in his ocular condition still remains.

Tuberculosis de la Córnea.—(DODD.)

Esta rara condición presenta un cuadro clinico único, en que las lesiones son de estructura transparente y permiten la observación cuidadosa de su progreso y de los efectos del tratamiento. Es casi siempre secundaria.

El signo preventivo de costumbre es la inflamación de la margen de la córnea que semeja una conjuntivitis flictenular. Está compuesta de diminutos focos de células gigantes y epiteloideas en las cuales se encuentra algunas veces el bacilo de la tuberculosis. Estos focos se extienden gradualmente hacia la cornea y rodeados de los elementos celulares infiltrantes forman el cuadro clínico típico de esta condición. El tratamiento ordinario tiene muy poco efecto en estas afecciones que duran meses. La mas ligera irritación produce nuevos focos.

Las injecciones de tuberculina con el objeto de hacer un diagnóstico producen una reacción local y general que se manifesta por inflamación marcada del ojo, aumento de la infiltratión córnea y producción de nuevos focos. Con el uso de la tuberculina (T. R.) en dosis pequeñas, los focos desaparecen y raramente dejan opacidad alguna.

Las dosis mayores de tuberculina producen un aumento de la infiltración que tarda varios dias en desaparecer. Esto demuestra la necesidad de ser mas cuidadoso en su uso para evitar perjuicios y favorecer el aumento de resistencia al progreso de la enfermedad.

Tuberculose de la cornée.—(DODD.)

Cette affection rare présente un tableau clinique unique, les lésions ayant une structure transparente, qui permet d'observer attentivement leur progrès et l'effet du traitement. Cette maladie est presque toujours

secondaire. Elle commence d'habitude par une enflure du bord de la cornée, enflure qui ressemble à une conjonctivité phlycténulaire, et qui, se compose de petits foyers de cellules épithelioïdes et de cellules géantes contenant quelquefois les bacilles de la tuberculose. Ces foyers s'étendent petit à petit à la cornée et, avec l'infiltration générale de cellules rondes autour d'eux, produisent le tableau clinique dont nous avons parlé plus haut. Le traitement ordinaire a très peu d'effet sur cette maladie, qui dure pendant des mois, de nouveaux foyers prenant naissance à chaque légère irritation. Les injections de tuberculine pour le diagnostic ont pour effet une réaction générale et locale, qui se manifeste par une inflammation remarquable de l'oeil, par une plus grande infiltration de la cornée et par la formation de foyers nouveaux. Par l'emploi de la tuberculine nouvelle (T. R.) en petites doses, les taches disparaissent, laissant rarement une opacité après elles. Ces expériences montrent combien de soin on doit prendre dans l'emploi de la tuberculine pour ne pas faire de mal et pour provoquer une plus grande résistance contre le progrès de la maladie.

Tuberkulose der Cornea.—(Dodd.)

Diese seltene Erscheinung präsentiert ein einzig darstehendes klinisches Bild, indem die Verletzungen von einer durchsichtigen Struktur sind, eine sorgfältige Beobachtung ihres Fortschreitens und der Wirkung der Behandlung erlauben. Es ist fast immer secundär.

Der gewöhnliche Vorlaufer ist ein Geschwulst am Rande der Cornea, welche ähnlichkeit mit phlyctenulärer Conjunctivitis hat. Dieser ist von kleinen Herden epithelioider und Riesenzellen zusammengesetzt in welchen die Tuberkelbacillen gelegentlich gefunden werden. Diese Herde erstrecken sich nach und nach in die Cornea, und mit der allgemeinen Rundzelleninfiltration um sie herum geben sie Veranlassung zu dem typischen klinischen Bilde. Gewöhnliche Behandlung hat auf diese Erscheinungen sehr wenig Wirkung, da sie Monate lang andauern, und auf die leichteste Irritation ein neue Herde entstehen. Tuberkulininjektionen zu diagnostischem Zwecke verursachen eine allgemeine und auch eine lokale Reaktion, welche sich durch bemerkbare Entzündung des Auges stärkere Infiltratbildung in die Cornea und die Bildung neue Herde manifestiert. Durch den Gebrauch des neuen Tuberkulins (T. R.) in kleinen Dosen verschwinden die Flecke und lassen selten eine Trübung zurück. Einer zu grossen Tuberkulindosis folgt fast immer ein Vermehrung der Infiltration, die erst nach einigen Tagen zurückgeht. Das zeigt, dass Sorgfalt nötig ist um in seiner Anwendung Schaden zu verhindern und nur ein verstärkte Widerstandsfähigkeit gegen den Fortschritt der Krankheit zu schaffen.

TUBERCULAR DISEASE OF THE MIDDLE EAR.

By Clarence John Blake, M.D.,
Boston.
(Presented by Dr. H. O. Reck, Baltimore.)

The clinical characteristics of a tubercular invasion of the middle ear may be said to be the apparent suddenness of its onset, the comparative painlessness of its course, and the rapidity with which an extensive destruction of tissue is accomplished.

This picture is so definite in its outline, the composite resulting from the superposition of a number of recorded cases by different observers is so clear, that it does not need to be enlarged for the purpose of investigation as to the causes underlying this uniformity of manifestation, and the determination of the presence of the tubercle bacillus may be regarded as superfluous to the diagnosis, when the aural characteristics are taken in conjunction with the evidences of tubercular disease, to which the aural implication occurs as a supplemental process.

As to the mechanism of infection of a cavity, which would seem to be particularly exposed because of its relationship to other frequently primarily affected parts, and particularly susceptible, because of the contour of its interior and the character of its normal contents, the majority of writers are of the opinion that this comes about most frequently through the medium of the tympanopharyngeal tube, that the infection is a primary one, so far as the middle ear is concerned, and that it does not, or in a minority of cases only, occur participatively, as the peripheral exhibition of a general systemic affection.

With this opinion in mind, and in view of the small percentage of cases of middle-ear disease of tubercular origin in the very considerable number of observed cases of pulmonary tuberculosis, the inference is at least permissible that the tubercular implication of the middle ear is, in the main, accidental, or dependent upon structural, and uniformly existent, conditions.

In support of this proposition may be taken the direct mechanical relationship of the middle-ear cavity to the larger cavity of the nasopharynx and the intimate reflex and circulatory relationship to other organs which may have become the seat of tubercular lesion.

Tubercular middle-ear disease develops most frequently in patients with

pulmonary tuberculosis, and seldom with tuberculosis of other organs, according to Borbone, and is most frequently caused by invasion of the bacilli through the lumen of the tube itself, or along the subepithelial tissue of its walls, according to Politzer, though infection through the blood may occur in tuberculosis of the glands and bones or in miliary tuberculosis, according to Barnick.

The primary tuberculosis manifesting itself mainly in the mastoid cavity has its origin in the cancellous spaces of the bone, through the medium of the circulation, or in the mucous lining of the pneumatic cells by transmission through the tympanopharyngeal tube. These cases are rare, but in all of them there is the excessive infiltration of the tissues and the rapid and extensive destruction which mark the progress of the similar infection of the tympanic cavity.

The irregular contour of the epitympanum, the opportunities thereby afforded for the lodgment of infective invaders, and the complicating presence of numerous folds of connective tissue and exceedingly vascular reduplicate mucous membrane, present a favorable field for the exhibition of the peculiar clinical manifestations of the tubercular infection, while the engorgement of the mucous folds, as the result of a suspense of vasomotor inhibition incident to reflex relationship with the pulmonary and nasopharyngeal seat of bacterial activity, paves the way for that infiltration of the tissues, in the implicated area, which lessens their resistance to invasion and favors their more rapid destruction.

This condition, which may occur at any stage of pulmonary tuberculosis, but is more frequent in the advanced cases, is illustrated by the painless onset of the middle-ear implication, an onset also characterized, subjectively, by impairment of hearing to sounds aërially conveyed, sense of fullness in the depth of the ear, moderate circulatory tinnitus, and, objectively, by edema of the pars flaccida and upper portion of the membrana vibrans, especially the posterior superior segment, with little or no injection of the manubrial and peripheral blood-vessels, a picture distinctly differentiated from the objective manifestation of epitympanic implication of other than tubercular origin, and one occurring, moreover, more frequently, in the observed cases, in the ear corresponding to the side upon which the pulmonary manifestation of the disease was more pronounced. So rapid is the destructive process in the majority of these cases of manifestation of tubercular infection in the epitympanum that close observation is necessary to determine their course; the edema is liable to be followed by a rupture of the thin and distended pars flaccida, and succeeded by a perforation of the posterior superior segment of the membrana vibrans, extending rapidly, in some instances, to almost entire destruction of the membrane, and accompanied by the outflow of a thin fluid, clear and limpid, or slightly discolored

and curdy, usually odorless, at first, but later becoming fetid as the destructive process invades the ossicular articulations and bony necrosis begins.

While the perforation of the pars flaccida may be accounted for in part mechanically, in the extreme distention and impaired vitality of that delicate membrane, the perforation of the more resistant membrana vibrans is usually effected by the cheesy infiltration of the mucous membrane and the formation of the tubercle nodules, first described by Schwartze,* a formation which may take place in any portion of the membrana vibrans, or at several points simultaneously, thus giving rise to the peculiar multiple perforations, coalescing later in one large opening, and occurring more frequently, in the observation of Dr. Buck and of the writer,† in the posterior superior segment.

The preliminary objective symptoms of a perforation of this kind are a circumscribed area of vascular injection, upon the otherwise pale edematous drum-head, with one or more distinctly delineated, pearl-like spots which mark the presence of the tubercle nodules. At these spots ulceration occurs and the membrane becomes speedily perforated.

With the excessive infiltration of the lining membranes of the tympanic cavity, membranes so intimately associated both structurally and through circulatory anastomosis as to partake easily in subjection to so destructive a process as that incident to tubercular disease, there is a lowering of resistance which favors implication of the underlying bony wall, first, through its denudation, and, second, through the translation to it of a necrotic process.

The diseased areas of bone may at first be limited and confined to the ossicles, especially to the articulating facets, or to depressions on the tympanic walls, but, as the process of denudation extends, these areas extend also and become correspondingly penetrative. Portions which are readily denuded—the rounded surface of the promontory, for instance—are more subject to penetration, and cortical labyrinthine necrosis is a not infrequent implication in advanced cases, though the statistics of suppurative invasion of the labyrinth show that in about one-third of the tubercular cases the passage inward has been through the labyrinthine windows. The intracapsular sequence is a thickening and partial destruction of the membranous labyrinth, with cell-production and connective-tissue formation. According to Politzer,‡ tubercular suppurations of the middle ear lead much less frequently to intracranial complications than do the ordinary suppurations due to the streptococcus. Where the carious process of the petrous bone is extensive, the fatal termination is caused more often by pulmonary phthisis than by purulent or tubercular meningitis, brain abscess, or sinus phlebitis.

* "Pathologische Anatomie des Ohres," 1878.

† Blake and Buck, New York Medical Journal, 1886.

‡ "Diseases of the Ear," Ballin and Heller, 1903.

There is another peculiar aural manifestation, evidently rare, since it does not find its place in the literature of the subject, which is worthy of the attention of otologists, and that is the edema of the upper portion of the drum-head, without, or with but slight, injection of the blood-vessels of the corresponding region, observable in some cases of tubercular meningitis in children in whom the anastomosis between the intracranial and epitympanic circulation would provide the means for the observed condition. In these cases there is usually moderate injection of the larger blood-vessels, crossing the posterior segment of the membrana vibrans from above downward, and sometimes in small, distinctly circumscribed area of congestion on the posterior canal wall.

The prognosis in tubercular middle-ear suppuration is usually unfavorable, especially in the acute cases, where there is early evidence of the implication of the labyrinth, and in the chronic cases, where there is extensive soft-tissue destruction, bony necrosis, and advanced pulmonary phthisis; but with the localized affection in the mastoid, for instance, in children, early operative measures may be favorably effectual. To be effectual, however, they should include thorough and painstaking removal of all necrotic and congested bone down to the surrounding healthy soft tissue, muscle, or dura, and the excision of all neighboring tubercular glands.

The favorable results of operation include mainly the cases of primary tuberculosis of the mastoid in children and, in adults, the cases in which the pulmonary affection is not advanced. In the majority of advanced cases, with extensive necrosis already established, operation is contraindicated because of its futility, the rule in the operable cases, therefore, being to operate as early as is possible and as completely as is necessary and admissible. In the non-operable cases, local treatment should include such thorough cleansing of the affected parts as is attainable, and such limitation of the destructive process as may be possible. The application of suction and of the artificial compression hyperkinesia of Bier to these cases, though ardently advocated by some observers, has as yet too little accumulated evidence of its value to make its use other than investigatory.

The demonstration of the presence of the tubercle bacillus in the discharge from a suppurative middle ear is one of such difficulty that its apparent absence is no indication that the process is not tubercular. The suppurating middle ear, moreover, exposed by the destruction of its soft tissues and with its resistance capacity reduced, becomes the seat of other invasions, and a mixed infection makes exact determination very difficult. Under these circumstances the value of exact clinical observation of objective symptoms becomes enhanced, and it is to be hoped that the awakened conscience of the past decade, which has stimulated the united action of the medical profession and the public in the present campaign against a dread disease, will find an answering effort on the part of investigation in otology.

La Tuberculose de l'Oreille.—(Blake.)

Les aspects cliniques de l'infection tuberculeuse, tels qu'on les voit dans l'oreille moyenne, et les conséquences montrées dans l'implication avancée de l'os temporal ont été décrits par les premiers otologistes; mais ce n'est que depuis une dizaine d'années qu'on s'est occupé soigneusement d'une forme d'infection de l'oreille moyenne et du labyrinthe caractérisée par une destruction considérable et rapide de tous les tissus, sans parler d'une absence particulière de symptômes subjectifs préliminaires.

La susceptibilité de la cavité de l'oreille moyenne à l'infection, par l'intermédiare du tube tympano-pharyngien, et le caractère et la location des tissus sensibles dans l'épitympanum expliquent l'implication plus commune de cette cavité, tandis que la singularité des symptômes objectifs démontre l'importance de l'examen aural pour un diagnostic différentiel.

THE SURGICAL TREATMENT OF TUBERCULAR LESIONS OF THE UPPER RESPIRATORY TRACT.

By D. Braden Kyle, M.D.,
Philadelphia.

The surgical treatment of tubercular lesions involving the structures of the upper respiratory tract is dependent upon a number of conditions, namely, whether the lesion is a primary or a secondary one, the general condition of the patient, the location of the lesion, and the structures involved in the actual lesion; also whether the lesion is an acute one or in its early stages, or whether it is a chronic process.

There has been considerable discussion and difference of opinion, as expressed in the various text-books and journalistic literature, as to the existence of a primary lesion involving the nose, nasopharynx, pharynx, uvula, tonsil, mucous membrane of the cheek or tongue, and of the pharynx. Personally, there is no doubt in my mind that such primary lesions do exist, and in such primary lesions surgical interference offers more in a curative way than when such lesion is secondary to structures involved elsewhere. Necessarily, from this statement would be deducted the fact that surgical interference does not offer much in tubercular lesions, as the majority of tubercular lesions are secondary. This certainly has been my experience in private and hospital practice, that, in the vast majority of cases, surgical interference does not offer much in a curative way, but occasionally does afford some palliative relief.

That tubercular lesions of this upper respiratory tract usually present themselves in one of three conditions, namely: The ulceration, the nodule involving the basement membrane, and the papillomatous excrescences which form about a tubercular area. The ulcerative process usually shows a mixed infection, which, I believe, always occurs after, and not before, the ulceration.

If by curettement or cauterization or by the use of the knife the entire tubercular area could be removed, then such interference would be justified. Unfortunately, however, except in the primary lesion, the process is not limited to the one nodule, and post-mortem examinations in such cases have always shown multiple nodules in various stages of development, so that by the mere removal of one nodule only temporary relief would be afforded.

Besides, the lymphatic areas which are so abundant in the mucous membrane structures would be opened up for further infection, as, unfortunately, the antiseptic precautions which can be used on the surface of the body cannot be employed in operations on the mucous membrane. Many cases are reported cured by the use of cauteries, caustics, and curettement. Whether they were primary cases or secondary is not always definitely stated. In fact, it is a question that is often very difficult to determine, but in some of the cases unquestionably the diagnosis of tuberculosis was not fully established. Unless the tubercle bacillus can be demonstrated either in the secretion or from direct inoculation from the infected area, I certainly would insist on the therapeutic test being employed to eliminate the possibility of the lesion being a specific one. Specific lesions about the upper respiratory tract more frequently yield to treatment than do the tubercular ones. In a primary tubercular lesion involving the nasal mucous membrane, especially at the junction of the skin and mucous membrane, or involving the uvula, the tonsil, or the tongue, a cure may be perfected by thorough excision. This, however, I do not believe to be true when it involves the larynx. As a rule, when the surgeon is consulted in regard to the process involving these structures, the disease is well advanced and has been treated by various agents, irritant and otherwise, and, as a rule, the lesion is not a single one, but multiple. The efficiency of surgical interference under such conditions I doubt very much.

In pulmonary tuberculosis with local lesions in the larynx, especially involving the vestibule and the vocal cords, there is sometimes seen a granular condition resembling very much the specific granulomata. In several cases I have seen this exist to such an extent as greatly to interfere with breathing. Surgical interference in the way of removal of these excrescences will establish free breathing, and, in my experience, has never caused any spread of the disease in the local area. These excrescences, however, are more of a fibroid nature and have very little epithelial structure, and are largely devoid of lymphatics, which may account for the fact that there is very little likelihood of spreading of the ulceration following any destruction of tissue.

Another important point in surgical interference is this: If the patient with a primary or secondary lesion is in a climatic condition which is most favorable,—for example, the high, dry altitudes of our Rocky Mountain States,—surgical interference certainly offers better results than it does in the low altitudes, as in the middle west and the east.

The question of surgical interference, again, is also largely determined by individual patients; with extensive glandular involvement, with large localized pulmonary lesions, with the general condition of the patient away below par, no matter what the climatic conditions, surgical interference offers very little other than palliation. Localized tubercular glands of the neck,

the infection of which probably passed through the tonsillar tissue or the lymphatic areas of the nasopharynx, and became localized in the cervical glands, do not present the same surgical aspect as a local lesion of the mucous membrane. A tubercular lesion limited to the tonsil, by thorough removal of the infected organ, provided infection through the lymphatics has not already taken place, may remove the danger of any systemic infection.

To my mind the whole matter can be summed up in this way: That surgical interference first would depend on the individual case, whether it is primary or secondary; whether the lesion is single or multiple; the location of the lesion; the history of the patient; his age and his general condition; his surroundings; the climate; his ability to procure nutritious food and proper care—in other words, that surgical interference rarely ever offers curative results, but is frequently palliative, and in many cases would be decidedly detrimental, and only tend to spread the disease. In advanced cases the tissue resistance is very poor, and by opening the lymphatics you only insure further invasion.

In purely primary local lesions involving any of the mucous membrane of the upper respiratory tract, if seen early, surgical interference is certainly justifiable if the lesion is single, and a thorough removal of the infected area will relieve the individual of any danger of further invasion; but where the lesion is secondary, my experience has been that surgical interference certainly offers nothing from a curative standpoint. A tuberculous nodule is not formed until the connective tissue is invaded. When such a nodule is detected, it is often impossible to determine whether other structures have been invaded and latent lesions formed, which may develop later, giving rise to systemic infection. In such a case, surgical interference can only subject the patient to needless suffering.

TUBERCULOSIS OF THE NOSE, MOUTH, AND PHARYNX.*

By Harris Peyton Mosher, M.D.,
Boston.

TUBERCULOSIS OF THE NOSE.

Owing to the filtering power of the nose, relatively few bacteria reach the pharynx. In addition to its filtering power, the nasal cavity, through the secretions of the mucous membrane, exerts a marked inhibitory growth upon many bacteria. On account of these factors, and, in addition, owing to the slow growth of the bacillus of tuberculosis, the nasal cavity is rarely the primary seat of tuberculosis.

Tuberculosis of the nose occurs in two forms:

1. The first form of tuberculosis of the nose is a local affection, occurring in the anterior part of the nasal cavity, in the region of the triangular cartilage of the septum. Accompanying this form there are few, if any, manifestations of tuberculosis in other parts of the body. The lesion is characterized by a flat infiltration or a superficial ulceration. It is very suggestive that the tubercular lesion occurs on the septum at the point where ulcerations are so often caused by picking with the finger-nail.

2. The second form of tuberculosis of the nose is characterized by a sufficient overgrowth of tissue to result in tumor formation. It is usually a complication of tuberculosis of the lungs or of the pharynx.

Microscopic Findings.—The infiltration consists of a diffuse collection of round-cells interspersed with a few giant-cells. These show but slight tendency to caseation. Tubercle bacilli are not numerous, so that they are generally very hard to find.

The Gross Appearance of the Lesion.—The infiltration usually presents a superficial ulceration, which has an irregular edge. This is often undermined. The ulceration is covered with a mucopurulent, odorless secretion. There may be a slight odor, but it is never very pronounced. The ulcer has a rim of granulations or tubercles, and similar tubercles are dotted over its floor. The tubercular process attacks first the mucous membrane, then the cartilage, and finally the opposite mucous membrane.

* In this paper the writer has made free use of the articles of Wood, Levy, and Zarniko.

The result of this is a bilateral swelling of the anterior cartilaginous part of the septum, which may block the lumen of the nose. In time the floor of the nose, the inferior meatus, and the inferior turbinates become involved. In such extensive cases the infection may work its way to the pharynx or even to the larynx. Sometimes, in these very cases, the bony structures become involved.

The Course and Symptoms of Tuberculosis of the Nose.—The course of tuberculosis of the nose is very chronic. There is no pain, unless secondary infection takes place. The patient complains only of nasal obstruction and an increase of secretion.

Complications.—The tubercular process may extend to the pharynx, or it may travel up the tear-duct to the conjunctiva. Often the retropharyngeal, the submaxillary, or the jugular glands become infected.

Tuberculosis of the Nasal Mucous Membrane and Lupus.

In many cases where there is tuberculosis of the nasal mucous membrane there exists, at the same time, lupus of the tip or of the alæ of the nose. The process in the two places is so similar that many writers, with good reason, consider them the same condition. Caboche maintains that the process in the nose is the same as the process in the skin, and that both are lupus. He holds, further, that lupus of the face is always primary in the nose. If this is true, it is a very important fact in the treatment of lupus of the face. This writer holds that, wherever there is a perforation of the cartilage of the septum combined with destruction of the alæ of the nose, the disease is not tuberculosis, but lupus. Long-continued eczema of the nares raises the suspicion of beginning lupus.

Diagnosis.—In making a diagnosis of tuberculosis of the mucous membrane of the nose, the principal disease to rule out is tertiary syphilis. The differences between the two conditions may be tabulated as follows:

1. In the neighborhood of a syphilitic ulceration there is an intense inflammatory reaction of the mucous membrane. There is no inflammation about a tubercular ulceration.

2. Syphilis attacks by preference the bony framework of the nasal cavity. Tuberculosis selects the cartilage of the septum.

3. Accompanying the bony caries of syphilis there is a marked stench. There is seldom any odor in tuberculosis of the nasal cavity.

4. As a rule, in syphilis of the nose there is headache or neuralgia of some of the neighboring branches of the fifth nerve. In tuberculosis there is rarely any pain.

A piece of tissue may be removed for microscopical examination, but in such cases it is often very hard to distinguish syphilis from tuberculosis. Giant-cells may be present in both conditions. The failure to find giant-

cells with central caseation, and the finding of an endarteritis, speak for syphilis. The only positive proof of tuberculosis is the finding of bacilli. The finding of bacilli, however, is generally very difficult. When the diagnosis of the nature of the nasal condition remains in doubt, it may be made clear by the use of iodid of potash or the injection of tuberculin.

At times other conditions besides syphilis must be ruled out in making a diagnosis. For instance, the presence of abundant granulation tissue calls for the elimination of malignant disease, especially sarcoma. A foreign body in the nose also may cause a growth of granulation tissue. Malignant disease can be differentiated by the microscope. The finding of a foreign body and its removal are followed by the disappearance of the granulations. This makes the diagnosis clear.

Prognosis.—Tuberculosis of the nasal mucous membrane, as a rule, goes slowly and steadily onward. For a time it may be made to heal, but it generally breaks out anew.

Treatment.—The best treatment is the radical removal of the focus. This is often difficult, because the lesion which can be seen by the eye is surrounded by microscopical tubercles, which cannot be seen. These lead to rapid recurrence. In those cases where there is a tubercular tumor, the body of the growth may be snared off. After this is accomplished the base of the tumor, and a generous amount of the surrounding mucous membrane, should be removed with a curette. The curette is the most useful instrument for dealing with tubercular manifestations in the nose. When much tissue is to be destroyed, thorough work can be done only under an anesthetic. For small or disseminated foci, heated air, the galvanocautery, or lactic acid may be employed.

Lactic acid is the agent most commonly used. Some writers advise rubbing in the concentrated solution. Others place tampons in the nasal cavity saturated with an 80 per cent solution. The tampons are left in place three hours. A slough forms on the diseased area, but the healthy mucous membrane is only whitened, it is not cauterized. On the second day the slough caused by the first application is removed, and the treatment is repeated. This is carried out for a week. Heated air can be used only in the anterior part of the nose. On this account one writer, Hollander, has split the nose, cauterized it, and sewed the incision together again. In this procedure there is danger of tuberculosis appearing in the incision.

General treatment is just as important in tuberculosis of the nasal cavity as in the treatment of tuberculosis of other parts of the body. Wherever there is a primary tubercular lesion of the nasal cavity, it would seem that the use of tuberculin should have a special field. It is probable that many cases of tuberculosis of the nasal mucous membrane are overlooked. Leprosy often begins in the nose in small yellow tubercles or vesicles. These are

found, on examination, to be almost pure cultures of the bacillus of leprosy. In one case which came under my observation there were but three such small lesions in the nose, and they were almost overlooked. In this case, however, the bacilli had been sent over the body and had caused marked lesions on the patient's legs. There is no apparent reason why the tubercle bacillus from a small lesion in the nasal mucous membrane could not follow the same course.

The Second Form of Nasal Tuberculosis.

The first form of nasal tuberculosis which has just been spoken of is characterized by infiltration and ulceration. The second form of tuberculosis of the nasal cavity is characterized by tumor formation and by a tendency to spread. The first form is a local affection; the second is part of a general infection or soon causes a general affection. This form often leads to tuberculosis of the pharynx.

This type is malignant, and soon ends in death. General tuberculosis can be demonstrated so readily that the diagnosis of the nature of the pathological process in the nose is easy. The prognosis is always bad. In the advanced cases only palliative treatment with menthol, orthoform, or cocain is advisable.

TUBERCULOSIS OF THE MOUTH.

In tuberculosis of the mouth the lesions may be found on the lips, the cheeks, the gums, the alveolar process, the hard or the soft palate, or the tongue. It is comparatively rare to find a tubercular lesion involving but one of the structures of the mouth. Such cases form a class by themselves.

The Forms of Tuberculosis of the Mouth.—Tubercular lesions of the mouth may be divided according to the pathological changes; according to their mode of development; and according to their clinical course.

1. Classified according to the pathological changes, there are found nodular infiltration, superficial ulceration, deep ulceration, necrosis of bone, chronic abscess, and tumor.

2. Classified according to development, there are the ascending and the descending types. The ascending type is caused by inoculation and is purely local. The descending type is caused by infection through the blood or through the lymph-channels. With this there is often systemic infection.

3. Classified according to their clinical course, tubercular infections of the mouth are benign or malignant. The lesions in the ascending form are sluggish in their growth, and so are benign. In the descending tuberculosis arising from miliary deposits, or from infection from within, the lesions are more active. Such lesions are classed as malignant.

4. Classified according to the origin of the infection, tubercular lesions of the mouth are either primary or secondary. In primary tuberculosis of the mouth the infection enters at the point of the lesion. In secondary tuberculosis the lungs or the blood-current furnish the infection. Secondary tuberculosis of the mouth is, therefore, a part of a general tuberculosis.

Etiology of Tuberculosis of the Mouth.—There are many cases on record of tuberculosis of the tongue. In all, the history of the disease is generally the same. The lesion begins with a slight injury of the mucous membrane, which refuses to heal, and in time is supplanted by a typical tubercular ulceration. The bacilli, one would think, would be most liable to effect their entrance at the point of injury, but there is a tendency among some writers to look for a distant source for the infection. They maintain that the infection comes from a bronchial gland which has become infected from the lungs, or that it comes from a latent tuberculosis of the faucial or pharyngeal tonsils, or even from bacilli harbored in a diseased tooth. This seems a bit fanciful, although it is undoubtedly true that the chief sources of infection in tuberculosis are the lymph- and the blood-currents. The tongue is protected by its thick coating of epithelium, and the mouth by its mucous membrane. The unbroken epithelium of the tongue and the intact mucous membrane of the mouth are not easily infected. In cases of pulmonary tuberculosis both are continually bathed in infected sputum, yet tubercular lesions of the tongue or of the mucous membrane of the mouth are the exception, not the rule. That trauma plays an important part in producing tubercular lesions of the mouth is shown by the fact that tuberculosis of this region is three times as frequent in men as in women. Men naturally subject their mouths to more trauma than women, and, as a rule, take less care of their teeth. Another argument along the same line is the fact that tubercular ulcerations are often seen about ragged and carious teeth.

The Course of Tuberculosis of the Mouth.—Tuberculosis of the lips, the cheeks, the gums, the hard palate, or the tongue pursues a slow course and is comparatively non-malignant. Tubercular ulcers of the mouth advance slowly and seldom completely heal. A few cases have been known to heal spontaneously, and a small percentage can be made to heal by treatment. They are a source of but little discomfort. Unless they are painful and so interfere with swallowing, they have but slight influence upon the course of a case of tuberculosis of the lungs. It should be remembered that tuberculosis of the tongue may at times be very malignant.

Diagnosis.—There is a natural tendency to regard every ulceration in the mouth and pharynx of a tubercular person as tubercular. It not infrequently happens, however, that a person having tuberculosis contracts syphilis. In such a case the lesions of both diseases may appear in the mouth or in the nose side by side. The great white plague and the great red plague

are seen together. After the healing of an extensive tubercular ulceration the contraction of the scar tissue may distort and fissure the tongue in the same manner as happens in syphilis. A fissured tongue, therefore, is not always a sign of previous syphilis. Where the tubercular ulceration is accompanied by an abundant overgrowth of tissue, the resulting lesion may look very much like carcinoma.

Lesions of the mucous membrane of the mouth are so readily inspected that tubercular lesions of the lips or of the tongue, for instance, can be thoroughly studied, and their characteristics determined. In discussing tuberculosis of the mouth, therefore, the description of the typical tubercular ulcer finds its most fitting place. Excluding isolated cases of tubercular tumor or abscess there exists in tuberculosis of the mouth a uniform local lesion. This consists in a pale, superficial ulceration, which is without inflammatory areola. The edges are irregular, beveled, or undermined. The ulcer spreads at the sides. A sticky, dirty white secretion covers it. When this is removed, the base of the ulcer is seen to be nodular. Scattered over the face of the ulcer and upon its margin there are soft, small, red granulations, interspersed with yellow or gray spots the size of a pinhead. These yellow spots, the spots of Trelat, may be seen also upon the mucous membrane adjacent to the ulceration. All these signs are not present in every tubercular ulceration, but they are in the majority. In every instance the diagnosis should be confirmed by microscopical findings, and in obscure cases by the inoculation of guinea-pigs. The findings, in sections, of giant-cells, together with caseous material, is almost certain proof of tuberculosis.

The Laboratory Methods of Confirming the Diagnosis of Tuberculosis.—

1. The detection of tubercle bacilli: (*a*) By the microscope; or (*b*) by the inoculation of guinea-pigs.

2. The detection in stained specimens of the histological structures of the tubercle.

1. *The Detection of Bacilli.*—(*a*) Owing to the frequent presence of bacilli in the mouths of tubercular patients, the examination of swabs made from a suspected ulcer is of no value. The proper method of procedure is as follows: The ulcer should be cleaned and cocainized, and then curetted or a piece removed. The curettings are thoroughly rubbed between two slides or cover-glasses until thin smears are obtained. The presence of tubercle bacilli in the smears should be substantiated by the finding of bacilli within the small clumps of cells which the rubbing has failed to separate.

If a piece of tissue is removed, this is hardened and stained for tubercle bacilli.

(*b*) *The Inoculation of Guinea-pigs.*—This method is called for only when other means fail.

2. *The Detection of the Histological Structure of the Tubercle.*—The histo-

logical structure of the miliary tubercle can generally be found in portions of the tissue which have been removed, sectioned, and stained. No one structure in itself is diagnostic. However, the presence together of giant-cells and caseation may be taken as sufficient proof of tuberculosis when the structure is not wholly typical. Often it is very hard to find bacilli.

Subjective Symptoms.—Tubercular lesions involving the lips, the gums, or the tongue may exist for a considerable time before the patient becomes aware of their presence. There is so little pain that an ulcer may attain considerable depth without making itself felt. This is in striking contrast to tubercular lesions of the pharynx or of the larynx. The ulcerations have but slight odor. Tubercular lesions of the tongue may at times be very painful.

Lesions of the gums or the hard palate, however, rarely give pain. Where the lesions of the mouth develop in the course of a severe general infection, they rapidly extend to the tonsils, the soft palate, and the pharynx. In these cases there is marked pain on swallowing.

Objective Symptoms.—Glandular involvement may or may not be present. Excluding the isolated cases in which the lesion consists of a tubercular tumor or a tubercular abscess, the typical tubercular ulceration which has just been described is present.

Treatment.—A tubercular tumor should be removed, its base curetted and treated with lactic acid. A tubercular abscess should be opened, and then treated in the same manner. A tubercular ulcer should be curetted and then treated with lactic acid. Any source of irritation, like a decayed tooth, should be removed.

TUBERCULOSIS OF THE PHARYNX.

The structures in the pharynx which are subject to tuberculosis are the faucial tonsils, the lateral folds of the pharynx, the uvula, the soft palate, the posterior pharyngeal wall, the pharyngeal tonsil, and the lymphoid tissue about the mouths of the Eustachian tubes. Tuberculosis of the tonsil is by far the most important. I shall not deal with tuberculosis of the different structures of the pharynx in their anatomical order, but shall deal with the less important forms first, and the most important, that is, tonsillar tuberculosis, last.

The Frequency of Tuberculosis of the Pharynx.—Fränkel found, in 50 autopsies on tubercular patients, that the pharynx was involved 10 times. In 3 of these cases the pharyngeal tonsil was involved alone, in 2 the lymphoid tissue about the Eustachian tubes. In the other 5 both regions were involved together. Wendt maintains that in tuberculosis of the pharynx there is seldom a complication of active disease of the middle ear. Often, however, in these cases the patient complains of a subjective sensation of fullness in the ear, with pain radiating from the ear on swallowing.

The Course of Tuberculosis of the Pharynx.—It is rare to have tuberculosis of the pharynx result from direct extension of a tubercular process in the nose. When tuberculosis of the nose and of the pharynx exist together, they are both usually a part of a general tuberculosis. Tuberculosis of the pharynx is seldom primary. Generally, the infection of this region is the result of the flood of sputum which is poured out by the lungs. In these trying cases the greater part of the pharynx may become excessively nodular and ulcerated. Fortunately such patients soon die.

Tuberculosis of the Uvula, the Soft Palate, the Pillars, and the Posterior Pharyngeal Wall.

The earliest signs of tuberculosis of the uvula, the soft palate, the pillars, or of the posterior pharyngeal wall is the appearance, in some part of the mucous membrane, of a pale, edematous area. Within this small area, submucous yellow spots the size of a pinhead can be made out. The yellow spots or tubercles break down and coalesce into an ulcer with characteristic worm-eaten edges. The ulcerations often become deep, but their margins always retain the typical granular or tubercular appearance.

Prognosis.—Where the pharynx is involved to only a slight extent, the tubercular lesion does not make the prognosis bad. Where, however, there is extensive ulceration, the patient has much difficulty in swallowing. On this account the prognosis becomes very poor.

Treatment.—Where the ulcerations of the soft palate or of the pharyngeal wall are small, they may be curetted or they may be swabbed with lactic acid. When they are extensive, orthoform or cocain must be used freely in order to enable the patient to swallow. If the patient is tolerant, he may be fed by the stomach-tube. In most cases, however, this procedure is too painful.

Tuberculosis of the Tonsil.

Frequency.—Of the different parts of the upper respiratory tract, the faucial tonsil is the most liable to tuberculosis. By far the greater number of cases are secondary. In pulmonary tuberculosis the tonsils are constantly bathed with sputum. Wood reports that in 136 cases of pulmonary tuberculosis 94, or 69 per cent., were found to be infected. Various investigators agree that primary tuberculosis of both the faucial and the pharyngeal tonsil occurs in 5 per cent. of cases. Wood believes that 5 per cent. of all children have tubercular tonsils.

Course.—The tubercular lesion in the tonsil may remain localized or the lesion may heal. In a great majority of cases the infection travels to the cervical glands. Having reached the glands, it travels from one gland to another. It is doubtful if the infection ever directly reaches the pleura from the glands. From the glands, however, the infection may reach the

lymph-current and through this the general circulation, by way of the venous system, and so produce a miliary tuberculosis. This happening, however, is rare.

There are two forms of tuberculosis of the tonsils—primary tuberculosis and secondary tuberculosis.

Secondary Tuberculosis of the Tonsils.—Secondary tuberculosis of the tonsils is more common than primary tuberculosis, but it is less important. I will speak of secondary tuberculosis of the tonsils first. Secondary tuberculosis of the tonsils is divided into two forms:

1. Acute tonsillar tuberculosis.
2. Chronic tonsillar tuberculosis.

Acute Tonsillar Tuberculosis.—Acute tonsillar tuberculosis is a part of a miliary tuberculosis, or it is a metastatic process occurring in the last stages of pulmonary tuberculosis.

Diagnosis.—In the earliest stages the mucous membrane of the tonsil becomes edematous and pale. Tubercles are seen beneath the mucous membrane. These presently break down and form the typical tubercular ulcer. This often causes great destruction of tissue.

Chronic Tonsillar Tuberculosis.—Chronic tonsillar tuberculosis is always latent and without symptoms. The majority of cases are due to infection from sputum. It has been found that the larger the amount of the sputum, the more often are the tonsils infected. Wood's statistics show that considerably over half of the cases of pulmonary tuberculosis develop secondary tuberculosis of the tonsils. Such cases run a mild course.

Primary Tuberculosis of the Tonsils.—In primary tuberculosis of the tonsils the infection may come through the blood from a distant focus, but, as a rule, it comes from the air-current or from food. Primary tuberculosis of the tonsils occurs in 5 per cent. of all tonsils. Some of these cases are instances of bovine tuberculosis, but just how frequently bovine tuberculosis of the tonsils occurs has not been worked out.

Pharyngitis Lateralis.—Pharyngitis lateralis consists in the formation of a small elongated tonsil over the surface of the stylopharyngeus muscle as it runs downward behind and parallel with the posterior pillar. In this hypertrophy of the lateral folds of the pharynx there is not only increase of the lymphoid tissue, but there is also the formation of crypts and follicles. A true tonsil in miniature, therefore, exists on the surface of the lateral folds. Tuberculosis of the lateral tonsils is the same in all respects as tuberculosis of the faucial or pharyngeal tonsil. Tuberculosis of the lateral tonsils is almost always secondary. It is recognized by the presence of tubercles or by the typical tubercular ulceration.

The Drainage of the Tonsils.—The faucial tonsil drains first into the superficial glands of the neck and then into the deep anterior chain of the

cervical glands. The pharyngeal tonsil drains into the retropharyngeal and suboccipital glands, and from here into the deep posterior cervical glands. These glands are placed behind the posterior border of the sternocleidomastoid muscle. It has usually been held that, by anastomoses with retrosternal, peritracheal, and bronchial glands, infection could travel from the cervical glands to the pleura or to the lungs. It is doubtful if this often happens. The pharyngeal tonsil is situated at the entrance to the respiratory tract, so that inspired air comes directly in contact with it. The faucial tonsils are placed at the entrance to the digestive tract, and come in contact more with food than with the inspired air.

The tonsil is a lymph-gland placed on the surface of the body. It is a very old fact that the bronchial glands will absorb foreign bodies like particles of dust. It is not surprising, therefore, that the tonsils will do the same thing. Bacteria are not absorbed so readily. The epithelium of the crypts seems to be the barrier to the entrance of bacteria. As soon as this is destroyed, the door is opened to infection. The comparative immunity of the tongue to tubercular infection is due to the thick layer of epithelium which covers it. The same reasoning would apply to the crypts of the tonsils. When this is thick or unbroken, the tonsils should be the least liable to infection. I believe that this is the case. Of late, the tendency has been to consider the amount of the bacterial dose rather than any mechanical barrier offered by the tissues, the chief factor in determining whether the tonsils are to be infected or not. All that is necessary, according to this view, for the production of tuberculosis of the tonsils, is to bring them in contact with a sufficient number of bacilli to overcome the resistance of the tissues.

I feel that the thickness of the epithelium which lines the crypts has much to do with the susceptibility of the tonsil to infection. At birth, the epithelium lining the crypts is relatively thick, but as soon as the germinal centers become active, they send off showers of lymphocytes. These pour upon the epithelium of the crypts, and in some places they tear it into finger-like prolongations, while in other places they scatter the cells so that but a very thin layer remains surrounding the follicle. This thinning of the epithelium of the crypts begins at six months and lasts through childhood. In adult life the activity of the germinal centers is over, and the epithelium of the crypts again becomes thick. In addition, the body of the tonsil gradually becomes fibrous and the tonsil shrinks in size. At the time that the epithelium of the crypts is thinnest, that is, in childhood, the tonsils are oftenest infected. It is at this period that tonsillitis is most frequent and enlarged glands most common. On theoretical grounds one might argue that the tonsils in childhood should be least liable to infection, owing to the protective action of the lymphocytes. They are made in such quantities by

the germinal centers that it would seem as if they might produce a liberal supply of protective vaccine. It may be that their stay in the tonsillar tissue is too short for this to be accomplished, because they tear their way so quickly through the epithelium to become inert in the crypts. In a submerged gland, like a gland of the neck, this does not happen.

The Liability to Systemic Infection from Tuberculosis of the Tonsils.—If a given part of the body is inoculated with tuberculosis, a local lesion develops at the point of infection. From this point the infection is carried to the nearest set of lymph-nodes. The tubercular bacilli are arrested here until the barrier is destroyed. When it is overcome, the infection proceeds to the next chain of glands, and finally reaches the venous system by way of the lymphatics. The tonsil is in reality a lymph-gland, but slightly differentiated from other lymph-glands. It does not seem, however, to have the same stopping power that the other glands possess. For instance, it has been proved experimentally that the tubercle bacillus will, after a few days, pass directly through the tonsil to the tonsillar gland of the neck, without leaving behind any microscopical change in the tonsil. A very large majority of enlarged cervical glands, perhaps 80 per cent., are tuberculous, and the infection comes from the tonsil.

It has been held that infection, once started in the cervical lymphatics, may continue downward, gland by gland, until the apices of the pleura are infected by extension and contact. Recent anatomical studies seem to show that this can occur but rarely. There is no gland constantly present in contact with the apex of the lung. Clinical observation bears out this anatomical finding. Tuberculosis of the cervical glands is, as a rule, a localized affection, and does not ordinarily lead to tuberculosis of the lungs. When tuberculosis of the lungs does take place from the cervical glands, the infection occurs through the lymphatic trunks and the venous system. In children the infection of the lungs, and hence the infection of the bronchial glands, takes place in most instances through the aspiration of tubercle bacilli into the bronchi. A descending tuberculosis of the cervical glands may be present incidentally. The aspirated bacilli may come from the air, but more often they come from the mouth, where they have gained access by the food or by contact (Grober).

Treatment.—For practical purposes the crypts of the tonsil may be considered as running completely through the body of the tonsil to its retaining capsule. Therefore in removing tonsils where they are the source of chronic infection, no operation is to be thought of except complete removal of the tonsil and its capsule by dissection. Where the tonsils give trouble merely by obstructing, less thorough removal may in certain cases be considered. In all cases of cervical adenitis the tonsils should be thoroughly removed as the first step in the treatment. The only exception to this rule is the presence of advanced pulmonary tuberculosis.

SECTION III.

Surgery and Orthopedics (*Continued*).

SECOND DAY.

Tuesday, September 29, 1908.

TUBERCULOSIS OF THE LYMPHATIC GLANDS, THE BREAST, PLEURA, AND LUNGS.

The Section was called to order at half-past nine by the President, Dr. Charles H. Mayo.

TUBERCULOSIS OF THE CERVICAL LYMPH-NODES: REPORT ON 275 CASES TREATED BY RADICAL EXTIRPATION.

By Charles N. Dowd, M.D.,
New York.

Tuberculosis of the neck lymphatics holds a unique position in surgery. It is the only common form of tubercular infection which can be removed surgically without injuring a single important structure and without serious disfigurement.

It is far otherwise with those forms of tuberculosis which are located in the bones and joints, in the abdominal organs, and in the lungs. The radical removal of the diseased foci from these localities would be most desirable, but is seldom possible without important injury to surrounding structures.

It seems a little strange that a locality so filled with important structures as the neck is should offer so favorable a site for the radical removal of tuberculosis. There are two elements to explain this:

1. The important structures are in the soft parts, and can usually be separated from the diseased tissues without injury.

2. The infection here is almost uniform in its development, first showing

itself in the subparotid nodes and then spreading in the lymphatics downward and backward, and occasionally forward. The dissection, therefore, can be carried on in a perfectly uniform and definite manner, and can be done satisfactorily in the stage of the disease in which the majority of the cases are now referred to the surgeon.

On the other hand, this form of tuberculosis is not especially well suited for hygienic, climatic, and medicinal treatment. The reports from institutions where these forms of treatment are used, and conversation with their physicians, indicate that patients with this form of tuberculosis do not show as much improvement as some of the others do, and that they are often referred to the surgeon.

I wish to ask your attention to a study of 275 cases of this illness operated upon in St. Mary's Hospital for Children, in the General Memorial Hospital, and in private practice during the last fourteen years. Nearly all the operations were done by the writer, a few of them by other members of the hospital staff. The technic has been given elsewhere. In each case the effort to remove all the diseased tissue has been made. The after-histories of the patients have been very carefully followed. Nurses have been employed for the purpose, under a special fund, and they have brought the patients back to the hospital for observation, and the observations have been renewed year after year.

The record of observations is as follows:

16 were followed more than 10 years
8 " " into the 10th year
4 " " " " 9th "
4 " " " " 8th "
8 " " " " 7th "
14 " " " " 6th "
16 " " " " 5th "
26 " " " " 4th "
28 " " " " 3d "
59 " " " " 2d "
42 " " " " 1st "
50 were not traced, or have had their operations very recently.

The results are as follows:

Among 54 *patients observed for periods of from five to thirteen and a half years,* 53 are apparently cured; that is, they are in vigorous health, having either no palpable neck nodes or only such small, hard ones as are believed to be hyperplastic and not tubercular. They are also free from evidence of tuberculosis in any other part of the body.

One patient, a woman of thirty-six, who had had operations on both sides of her neck, had a hickory-nut-sized nodule under the upper part of the sternomastoid, and two or three smaller ones below and in front of this, and a tendency to cough.

The very satisfactory condition indicates that those who have passed five years in good health since their operation need have little fear of serious recurrence.

The second group, of 42 *patients,* who have been under observation between three and five years, gives 37 apparent cures, 4 patients who have had recurrences and still have filbert-sized nodes in the neck, and 1 death from phthisis.

Thus, among 96 patients followed for periods of from three to thirteen and a half years are 93 per cent. of apparent cures, 1 death from phthisis, and 5 patients with recurrent nodes from which ultimate cure may be expected.

The group of 87 *cases followed from one to three years* gives 83.8 per cent. of apparent cures; 3 intercurrent deaths (2 from tuberculosis, 1 from typhoid fever); 8 patients with recurrent nodes at the time of observation, from most of whom an ultimate cure may be expected; 1 persisting sinus; 1 syphilitic swelling; 1 having had recent operation for recurrence.

In the group of 92 *patients followed less than a year* there were 80 (86 per cent.) who gave no evidence of tuberculosis when last seen; 4 who had recurrences in the neck when examined; 1 who had had a recent operation for recurrence in the neck; 1 who had tubercular peritonitis; 1 who had a syphilitic swelling in the neck. Five intercurrent deaths occurred in this group (1 from scarlet fever and 4 from tuberculosis); 1 post-operative death occurred from secondary hemorrhage from the internal jugular vein, the only operative fatality in the entire series of 275 cases.

If we tabulate these cases according to groups we have:

Group	I—54	cases,	followed	5 to 13½	years—	apparent	cures,	98	per cent.
"	II—42	"	"	3 to 5	"	"	"	88	"
"	III—87	"	"	1 to 3	"	"	"	83.8	"
"	IV—92	"	"	less than a	year	"	"	85.8	"

We are well aware that there are some patients in the list of apparent cures who will develop recurrences, and that most of those who now have recurrences will ultimately be cured. It is impossible to give a table of results with mathematical accuracy, since the patients cannot all be followed to the ends of their lives, but it is confidently believed that these tables give a very fair indication of the value of the method. They surely substantiate the statements that the neck is a particularly favorable site for the surgical treatment of tuberculosis, and that this operation is one of the most satisfactory of surgical procedures.

There are numerous topics which might well be considered about this series of cases. Some of them have already been discussed in other papers, others cannot be discussed now from lack of space, but a brief reference to two topics may be of value:

1. Sources of infection.
2. Operations for recurrences.

1. Sources of Infection.—This group of 357 cases corresponds closely to the group of 100 cases previously reported. Eighty-one per cent. showed the first noticeable infection in the subparotid nodes, indicating infection from the pharynx, tonsils, or posterior part of the mouth. In most of the remaining cases the submental or submaxillary nodes were the first ones involved, indicating infection from the teeth, front part of mouth, or face.

In a few instances lupus spots on the side of the face or scalp gave infections which traveled downward through the parotid group of lymphatics. In only one instance was there an ascending infection from the arm. This involved the axillary lymphatics, and at a later time those in the neck.

Through the courtesy of Dr. Wm. H. Park, Director of the Research Laboratory of the New York Health Department, the nodes from 35 cases were examined by inoculation and subsequent culture methods to determine the ratio of bovine to human type of tuberculosis. The ultimate results on 12 of these cases are at hand: only one was found to be of the bovine type, a child whose infection began at the age of twelve months. The indications lead one to believe that, in the great majority of instances, the infection comes from the lodgment of tubercle bacilli in the pharynx or posterior part of the mouth, probably mostly by inhalation.

2. Recurrences.—Besides knowing the likelihood of ultimate cure, physician, patient, and patient's friends wish to know the probability of eradicating the disease at the first operation. Among these 275 cases, 46 have had operations for recurrences. Twenty-six of them belonged to the severe type who have very extensive infections; some of them had recurrences either on the side of the operation, some on the other side, some on both sides. They were the unfavorable cases—about 10 per cent. of the entire number.

Fourteen had less severe recurrences, coming at periods of from a few months to five years, on the side of the original operation.

Four had secondary operations on the other side—respectively one, one and two-twelfths, four, and five and a half years after the primary operation.

Two had secondary nodes removed only from the axillæ.

The number of cases who received secondary operations is $16\frac{1}{10}$ per cent. of the entire number, as small a percentage as could well be expected. The results were excellent, as the previous tables show.

The existence of hard nodules the size of peas or beans, or even larger, is often puzzling. In 11 instances I have excised such nodules, sometimes after watching them two or three years, and have found them hyperplastic and not tubercular. Apparently they enlarge with the extra function which

comes to them after the removal of other lymphatics. We can indorse Van Noorden's statement that the existence of these small, hard, post-operative nodules does not indicate tuberculosis. In at least 12 instances I have seen them diminish in size or disappear during a period of long observation.

Tuberculosis de los Nudos Linfáticos Cervicales. Relato de 275 Casos Tratados por medio de la Extripación Radical.—(Dowd.)

La enfermedad es muy grave; la mortalidad de los casos no tratados es un poco menos de 50 por ciento.

Diferentes tipos de la infección.

Formas de la infección segun bovine y human. Relato de veinte casos estudiados por medio de la inoculación y las culturas.

Significación de los pequeños nudos endurecidos que aparecen después de la operación. Estudio microscópico.

La operación por lo general produce menos cicatrices que cuando el caso no es operado.

La mortalidad de los casos operados es una tercera parte del uno por ciento. La cura aparentemente es de 80 por ciento. Mejoría en diez ó mas por ciento.

Tuberculose des glandes lymphatiques cervicales. Histoire de 275 cas traités par extirpation radicale.—(Dowd.)

Maladie grave: mortalité de presque cinquante pour cent chez les personnes non traitées.

Divers types d'infection.

Formes bovine et humaine d'infection. Histoire de 20 cas étudiés par inoculation et culture.

Signification de petits ganglions insensibles postérieurs à l'opération.

Études microscopiques.

Opération rarement suivie de cicatrice.

Mortalité dans les opérations bien faites, un tiers d'un pour cent. Guérisons, à peu près 80 pour cent, et dix ou plus pour cent d'améliorations.

Tuberkulose der cervicalen Lymphdrüsen. Bericht über 175 Fälle von Radical-Exstirpation.—(Dowd.)

Die Erkrankung ist eine ernste; Mortalität unbehandelter Fälle wahrscheinlich nicht viel unter 50 prozent.

Verschiedene Infektionstypen.

Rinder- und menschliche Infektionsformen. Bericht über 20 Fälle sammt Inoculations- und Culturen-Befunden.

Die Bedeutung der kleinen, harten, postoperativen Knötchen. Mikroskopische Befunde.

Operation thut gewöhnlich mit der sonstigen Narbenbildung hinweg.

Mortalität nach Radicaloperation 0.33 prozent. Anscheinend 80 prozent Ausheilungen, mit weiteren 10 prozent oder darüber von Besserungen.

DISCUSSION.

Dr. E. M. Sala (Rock Island, Ill.) said he had had very good results in these cases with the *x*-ray treatment. There was no question in his mind but what the *x*-ray would make these nodules disappear in a reasonable time. His custom had been to give them about ten minutes' exposure with a good strong light, at a distance of five or six inches from the tube. He had had no severe burns at this distance. Surgery was the proper course of procedure, but where, for any reason, that could not be resorted to, good results could also be had from the use of the *x*-ray.

Dr. Charles H. Mayo (Rochester, Minn.) said they had operated on many cases. Children under eight seldom require operation. The local focus of infection should be eradicated, if possible; that is, the tonsil, adenoid conditions in the throat, and nasal troubles. If, after such treatment, there still remains for a period without improvement enlargement of the glands of the neck, then the operation would be indicated. Later in life the bulk of these cases should be treated, not only by the removal of the local focus, if that can be done, but the removal of the glandular group as well. Treatment by the *x*-ray does leatherize the tissues, producing a great deal of sclerotic tissue, and in that way is favorable. It is best to recognize only three groups of cervical glands—a deep group on each side, and a submaxillary and submental group—three together. If tuberculosis attacks one gland, the whole group must be removed. The lymphatic system is very closely connected with the blood, and it is no farther to the lungs through the lymphatic than through the air-passages. Recurrence takes place because the entire group of glands had not been removed.

Dr. Emil G. Beck (Chicago), spoke of the use of bismuth paste in the treatment of sinuses in connection with tuberculous glands of the neck. Only three cases had come under his observation which could be treated by this method. He had himself treated only one case, and in that case he had used it to prevent a sinus. This patient was so diseased with tuberculosis and had so many sinuses in his body that operation was not advised, but one of the glands was suppurating and ready to open. It was opened with a very small incision, the bismuth paste was injected, and it healed

without a sinus. Of course, it might have healed spontaneously. Where any tuberculous tissue had been left within the tract of the sinus, or where these sinuses had become infected by a remaining tuberculosis, it had been proved that all the microörganisms would disappear from the secretion in three or four days following the injection of the bismuth paste.

Dr. Dowd, in closing, said he had found one class of cases particularly in which the *x*-ray treatment was valuable. That was the class in which the infection was very virulent. The tissue resistance is very low. Such a patient, perhaps, would have the sternocleidomastoid muscle involved. The glands might be removed as thoroughly as possible, but a few weeks after operation there would be a diffuse swelling in the area of the operation. These cases were particularly unfavorable for further surgical work. Nothing would remove the tuberculosis short of the most radical possible procedure, taking out the muscle and the nerves that might be involved. That might be done for cancer, but he did not believe it wise to do it in tuberculosis. These cases did very well under *x*-ray treatment. There was also a large number of cases which would do well under *x*-ray treatment which were not of this type. But a good many cases would also do well under any form of treatment, or under no treatment at all. It is safe to say that at least half the cases would get well if we did not do anything for them. But there is a great difference between this number and the 85 or 90 per cent. who would get well if operated on as much as needed. As to operations on children under eight years of age, he believes that depends on the environment. In the tenements of New York, for instance, one would see frightful cases under eight years, and he was sure many of these cases needed operation. However, he agreed perfectly with Dr. Mayo that there are many others who would get well without operation.

RETROPERITONEAL TUBERCULOUS GLANDS AND THEIR RELATION TO SPINAL SYMPTOMS.

By Charles F. Painter, M.D.,
Professor of Orthopedic Surgery in Tufts Medical School, Boston, Mass

The relation of extraspinal abdominal lesions to the production of symptoms referred to the vertebral column is a matter which demands more attention than is commonly given it. The close approximation of the abdominal viscera to the anterior surface of the spinal column makes it possible to incite symptoms, both objective and subjective, which might easily lead one astray, not only as to the location of the lesions in question, but as to their actual character. Any pathological enlargement of the organs contained within the abdominal cavity may readily, through mere pressure (*e. g.*, aneurism), cause a list of the trunk and more or less restriction in the motions of the spine. This is especially true when the cause for such pathological enlargement is of an inflammatory character, resulting in the deposit, in the tissues about the anterior surface of the vertebral column, of an inflammatory exudate. Such exudates operate in two ways: they, in some cases, extend directly to the osseous structure of the column, and erode it, or they irritate the muscles which have their origin or insertion upon the column, and establish a condition of spasm in those muscles which is evidenced by pain, impairment of function, and oftentimes by deformity.

Perinephritic and nephritic abscesses and aneurisms, *e. g.*, are capable of doing this long before the existence of lesions of the kidney or blood-vessels is even suspected. Inflammatory conditions about the colon and appendix give rise to such distinctively characteristic signs that it is only rarely that the clinical symptoms are spinal, and when they are sufficiently acute to be unmistakable, the patient is rarely examined to see if there are signs suggesting spinal complication. Acute infectious processes in bone, *e. g.*, osteomyelitis, and even subacute infections, may cause decidedly significant spinal symptoms.

For the purposes of this paper it will not be necessary to go exhaustively into those more aggravated types of mesenteric and retroperitoneal glandular enlargements which are known as "tabes mesenterica," and are usually associated with emaciation, tumefaction of the abdomen, peritonitis, diar-

rhea, and vomiting. Such cases commonly occur in children, and in a majority of instances are fatal.

The conditions to which I would call attention are more frequently noted in adults, and declare themselves by producing symptoms and signs indicative of stiffness and deformity of the vertebral column. In some cases symptoms of intestinal obstruction have been noted, and these have developed, if not synchronously with the spinal symptoms, at any rate very nearly at the same time. In still other cases large abscesses have manifested themselves, either in the groins or perhaps more often in the thigh, leading one to suspect the existence of a tuberculous osseous lesion in the spinal column. In some instances one may find the suggestion of a knuckle and limitation in motion of the vertebræ in such localities, but more often the kyphos is lacking.

Warthin,* discussing tuberculous lymphadenitis, expresses the belief that tuberculous enlargement of the retroperitoneal and mesenteric glands is more common than is generally supposed. He bases this opinion upon the frequency with which, at autopsy, lesions of this kind are demonstrable. Many of these glands show signs of having passed through an actively inflamed stage, followed by cicatrization or calcification. He thinks infection of other parts of the body from these latent foci not at all uncommon. He is of the belief that some of the lesions are caused by the bovine form of the tubercle bacillus, and others still by the human type, the former being the common source of infection during the milk-drinking period of infancy and childhood. Painter and Erving† obtained statistics which demonstrated the frequent existence of these lesions at autopsy. Jacobi,‡ in discussing the typical "tabes mesenterica," gives expression to his belief in the existence of a less aggravated form of mesenteric glandular enlargement than that described as "tabes."

Anatomy.—A brief consideration of the anatomy of this region may serve to make more clear the manner in which enlargements of these glands may bring about irritative changes in the spine. In that portion of the abdomen where the radix of the mesentery is attached there is normally a forward bending of the column, constituting the normal lordosis of the spine, and in this mesentery run the lacteals in a closely intermingling network as they pass up to become the large chylous duct carrying the chyle to the venous circulation.

The glands in this region are numerous and serve to filter out bacilli which may be carried through the intestinal mucous membrane by the fatty emulsion to which the food is reduced prior to its absorption. Be-

* Osler's "Modern Medicine," vol. iv, p. 820.
† "Mesenteric Tuberculosis," N. Y. Med. Rec., 1903.
‡ Keating's "Cyclopedia of the Diseases of Children," 1890, vol. iii.

hind the mesentery there is also another set of glands, not surrounded on all sides by peritoneum, and it is in these glands particularly that those inflammations occur which result in an adherence of the lymph-nodes to the anterior surface of the spinal column.

Pathology and Bacteriology.—Hemmeter maintains that the occurrence of calcification and caseation in the retroperitoneal and mesenteric glands is sufficient evidence of their tuberculous infection. The demonstration of tubercle bacilli in the tissues or by animal inoculation is not necessary. He cites the fact that autopsies upon phthisical subjects at the age of eighteen to twenty show evidences of caseation, whereas such autopsies at forty to fifty show signs of calcification, thus indicating that, pathologically, calcification follows caseation, and either is sufficient evidence of tuberculosis.

Much importance attaches in scientific discussions in these times to the recognition of differences between the bovine and human forms of tubercle bacilli. If what seems to be true eventually can be proved, it will be of significance in the matter of the etiology of many of the spinal forms of osseous tuberculosis that seem to be caused by direct extension from the mesenteric glands. It is maintained by some observers that the glandular and osseous types of tuberculosis are caused by the bovine form of the tubercle bacillus, whereas the pulmonary type is caused by the human form of this organism. Glandular and osseous tuberculosis are decidedly more common in childhood, and pulmonary tuberculosis is by far more prevalent in adults. In childhood the staple of diet is milk, and if it can be proved that the bovine type of bacillus is invariably found in the tuberculous lesions of childhood and the human form only in those lesions in the adult, it would seem that the bovine origin of glandular and osseous tuberculosis had been pretty well established. Koch still contends that there is no essential difference between them. Behring, Theobald Smith, and others hold the opposite opinion. There have been a good many experimental demonstrations of the permeability of the intestinal coats by the tubercle bacillus. Jones* has shown that virulent forms of this organism may remain in the intestine for long periods and are present with considerable frequency. Britter† has demonstrated twelve out of twenty-five varieties of bacteria in the stools after having given them by mouth, thus dispelling the theory that the acids of the stomach can destroy them en route. Ravenel‡ cites literature to prove the frequent infection of the glands at the roots of the bronchi with tubercle bacilli. He fed cultures of this organism to cats through a catheter. In from six to ten days, in 75 per cent. of the cases thus infected, these animals had peribronchial tuberculosis. These experiments and those of others,

* "Physiology of Alimentation," Fisher, 1907.
† Deutsch. med. Woch., 1885, p. 843. ‡ Jour. Med. Research, vol. x, p. 460.

notably by Droblanski,* who has been a pioneer in this line of investigation, have demonstrated the infectivity of the glands of the body through the alimentary route. Bramwell† quotes statistics to show the great frequency of glandular tuberculosis in the abdomen in Scotland, as compared with the United States and Canada, and makes the suggestion that in the latter countries better milk inspection and consequently a purer supply may be responsible for this condition. At the children's clinic of the Mt. Sinai Hospital in New York, for the seven years between 1898 and 1904, there were 2266 patients admitted and only one case was diagnosed as abdominal tuberculosis. During the same period at the Edinburgh Children's Hospital there were 10,213 admissions and 378 cases of abdominal tuberculosis.

Clinical Course and Symptoms.—Having cited sufficient data to make it reasonably clear that, anatomically and pathologically, tuberculous lesions may occur, and as a matter of fact do occur, in the mesenteric and retroperitoneal glands, and that these structures may be directly infected through the intestinal tract without demonstrable lesions having been produced in the tissues of the intestine as the bacilli pass through, it remains, in order to fulfil the purposes of this discussion, to call attention to the frequency with which lesions so produced and situated may give rise to symptoms, and more especially to physical signs, which are strongly suggestive of spinal disease—in fact, in many cases are the forerunners of osseous lesions of the spine.

The earliest symptom is usually pain and stiffness. Great difficulty is experienced in assuming an erect position and in rising from a low chair or a bed after prolonged confinement to either. The advent of these symptoms is not generally rapid, but slow and gradually augmented. There is frequently a slight amount of deformity noted early, as, *e. g.*, a list to one side or a psoas contracture, causing limp. In other cases, when pain is not a conspicuous feature, the patient complains of stiffness in the spine and may note a swelling in the thigh or lower abdomen. Indeed, swelling may be the earliest suggestion of the existence of something wrong, and search for the origin of the enlargement brings into notice the existence of lesions more or less remote. As a rule, the swellings which occur in the lower quadrants of the abdomen and penetrate occasionally beneath Poupart's ligament are not inside the sheath of the psoas muscle, and therefore do not commonly give rise to the symptom of contraction and consequent flexion of the thigh.

When the spine is examined, the lumbar region is usually found to be held rigid to a greater or lesser extent. Rarely there is a slight anteropos-

* Arch. de Med. Experiment. d'anat. Path., 1890, vi 250
† Clin. Stud., Edinburgh, 1907–08, vi, 16–21.

terior curve, which may be dignified by the name of a kyphos in some cases, but which is not always a permanent deformity, though it may have a strong resemblance to a destructive osseous lesion. A significant clinical peculiarity of these pseudo-kyphoses is that, though two or three spinous processes may take part in the development of the deformity, yet in view of the rapid development of symptoms it is not sufficiently angular to be indicative of a central, vertebral lesion, and is, therefore, probably due to spasm of the spinal muscles. Obliteration of the lumbar lordosis is practically always present. Rigidity of the vertebræ does not commonly extend above the eighth or ninth dorsal, and generally not quite so far. Flexion of the trunk is more readily performed than lateral motions or hyperextension. Voluntary attempts to make these motions are not usually very painful.

Abdominal palpation, with the patient as much relaxed as is possible, preferably immersed in a hot bath, may reveal much or very little. At times there are localized accumulations of glands in the region of the root of the mesentery or about the colon which can be readily palpated. Their character cannot always be definitely determined by palpation alone. More rarely still diffuse masses of glands may be felt throughout the abdomen. Frequently one comes upon the evidence of a good-sized cold abscess, generally in the right side of the abdomen, rather more toward the median line than it is customary for a psoas to be located. When these abscesses gravitate toward the groin, they follow a different course from that pursued by pus within the psoas sheath, for the reason that the latter must come from the vertebral bodies and pursue a downward and outward course. These will not always yield a sensation of fluctuation, but are not accompanied, as a rule, by spasm of the rectus muscle on that side, or if they are, it is much less pronounced than in more acutely inflammatory conditions. In some of the diffuse, nodular accumulations of glands there is more rigidity of the recti than is noted in the suppurative cases. In many instances the abscess has quietly penetrated beneath the psoas, and fluctuation may be obtained through from thigh to lower abdomen. The presence of the abscess in the thigh may first have attracted attention by an increase in the circumference of the thigh.

Constitutional symptoms should be carefully studied in these patients. The presence of a continued slight evening rise of temperature is very suggestive of a tuberculous condition, and with such symptoms referable to the abdomen and no anteroposterior deformity of the spine, the evidence in favor of a tuberculous adenitis becomes much stronger. Occasionally, by palpation, bimanually, in the loin, deep-seated suppuration may be detected both through the sensation of fluctuation and by the presence of a tender mass. A septic temperature is rarely met with in this condition. Occasionally vertebral osteomyelitis may present symptoms not greatly

unlike these. A secondary anemia is not uncommon. An *x*-ray examination ought always to be made. It will sometimes be possible in this way to demonstrate the existence of glands, particularly if they have become calcareous. In some instances it is possible to develop the negative so that accumulations of glands which have not as yet calcified may be demonstrated. Even when such positive evidence is wanting, the ability to exclude the possibility of an osseous vertebral lesion is helpful in reaching positive conclusions regarding the glands. When a clear bill of health can be given the spine in the *x*-ray examination, some of the diagnostic difficulties are removed.

Complications and Sequelæ.—The common complications caused by the presence of these enlarged glands in the retroperitoneal region and in the mesentery are abscess, extension to the vertebræ, and intestinal obstruction. Suppuration is very common, is, in fact, perhaps the rule. It may be confined to one small group of glands which become matted together and then break down, or sinuses may appear in several places in the same person at the same time. The most common seat of suppuration is the groin and thigh. Occasionally an abscess will appear in the lumbar region. Pus obtained from these will frequently give positive evidence of the tuberculous nature of the trouble upon smears or injection into animals.

Extension of tuberculous disease from the affected glands to the vertebral column cannot often be positively demonstrated, but one case, to which attention is called among the cases cited, seems to the writer conclusive proof that such may be the sequence. In this case there had been more than a year of observation of the patient, during which time the low dorsal and lumbar spine became stiff and was held so by muscle spasm. At the end of that period, during which time he had worn a leather jacket, a large abscess appeared in the thigh and groin. This was aspirated. Ten days later the patient manifested signs of intestinal obstruction and died. An autopsy showed extensive glandular tuberculosis, which had matted the intestines together, and opposite the point of their greatest adhesion they had also become attached to the lumbar vertebræ, where there was a marked erosion of these bones and caseating tubercles were present. Apparently, the older process was in the glands, which had become calcified in many places. This is the only instance in my personal experience where it has been possible to demonstrate, by post-mortem examination, the direct extension of tuberculous glandular disease to the vertebral column, thus causing a true Pott's disease.

In two other patients, however, glands have been demonstrated in great abundance in the mesentery and retroperitoneal regions, and in both these cases indications of spinal disease were the most striking symptoms which the patients presented, and in both cases the spinal symptoms improved

coincidentally with the betterment of the glandular disease. One of these cases was operated upon to see if it was possible to remove the glands. They were retroperitoneal and filled the entire abdomen, practically displacing the intestine. Nothing could be accomplished surgically. Subsequently four sinuses developed, two in the groins and two in the loins. After protracted suppuration the glands all disappeared, the sinuses closed, the spine became freely movable, the patient gained 80 pounds in weight, and is perfectly well, doing hard work as a laborer.

The other case which came to operation had an emergency laparotomy for intestinal obstruction. He had been under treatment for spinal symptoms, though the glandular condition in the abdomen had been suspected, and he had been seen in consultation by a surgeon with a view to exploration over a month before his intestinal symptoms appeared. These glands were small, and were in the mesentery mostly, but caused matting of the intestines and obstruction. After the operation there was quite marked improvement, both in the general condition and in the local signs in the spine, though nothing like as pronounced as occurred in the patient whose glands were retroperitoneal.

One instance further adds its testimony to this series of cases. The patient was a young man who had pain, stiffness, and a list of the spinal column. Later there appeared rigidity of the right rectus muscle and a mass in the abdomen. This mass increased in size, and about a year after the first symptoms were noted, was operated upon and a large amount of pus was obtained, some of which, when inoculated into a guinea-pig, produced in due time typical tuberculous visceral lesions. The operative wound remained open for from four to six weeks. As the list of the spine did not readily correct itself, an *x*-ray examination was made, and a small osseous focus could be demonstrated on the anterolateral aspect of the body of one vertebra—the eleventh dorsal. Two years after the incidence of symptoms in this case there was a slight suggestion of a kyphos in this region and a very slight lateral deviation of two or three spinous processes. The patient has been entirely well some six or eight years. In this case positive proof of the existence of glands is wanting, but the sequence of clinical events makes it more than likely, it seems to me, that this was a case of primary glandular disease which extended directly to the spine.

It is not necessary here to more than allude to the third serious complication which these glands may give rise to, as it belongs more in the province of the general surgeon. I mention it only because it so happens that intestinal obstruction has occurred in two of my cases where spinal symptoms were the conspicuous ones from the outset, and one should be on the watch for this condition in patients with these signs.

Differential Diagnosis.—Enlarged tuberculous glands must be differ-

entiated from aneurisms, gummata, actinomycosis, sarcoma, and carcinoma, the infectious and hypertrophic types of arthritis, perinephritic and nephritic abscesses, appendicitis, and osteomyelitis. From aneurism the age of the patient, as well as the physical signs of arterial degeneration and the specific indications of an aneurism, must be searched for. A history of syphilis would make it necessary to try the therapeutic test in order to eliminate the possibility of such an infection. Actinomycosis is rarely a cause for intra-abdominal glandular enlargement. Examinations of the pus or the existence of other actinomycotic lesions might clear up the diagnosis. Malignant disease of the abdomen would be rare in individuals at the age of patients who most frequently suffer from mesenteric glandular enlargements. Primary sarcoma of the spine is more common in young people than is carcinoma. Primary carcinoma of the spine is practically unknown. Vertebral osteomyelitis has all the clinical characteristics of acute osteomyelitis elsewhere, and should be capable of differentiation without difficulty. Infectious and hypertrophic arthritis usually more completely stiffen the column, and the latter, at least, is characterized by a certain amount of motion in some directions. There are commonly other parts of the body affected in a similar manner in these conditions.

Treatment.—The management of these cases is largely dependent upon good hygiene, wholesome diet, and surgical rest. Inunctions and various internal medications have been tried without avail. Operative measures, except when directed to the aspiration of abscesses, is rarely indicated. A few successful cases of removal of these glands have been reported. Fixation of the spine is helpful in controlling pain, and possibly in preventing extension from the glands to the vertebral column.

Prognosis.—My experience with the foregoing cases and with some others not here reported leads to the belief that no case of this condition is so desperate that it may not recover. Certainly some of the most distressing conditions have been restored to health when there was apparently absolutely no reason to expect they would be. The serious complications are those which tie up the intestines so that intestinal obstruction is brought on. My belief is that the mesenteric glandular enlargements are much more serious than the retroperitoneal.

Conclusions.—It has been pretty conclusively proved that the intestinal route is frequently employed by the tubercle bacillus in gaining access to the human body. This organism may pass the stomach unchecked in its progress, and make its way through the intestinal coats without producing any evidence in these structures of its passage. It has been shown that the mesenteric retroperitoneal as well as the bronchial lymphatic glands may become infected in this manner. Clinical evidence of the enlargement of these glands may often be obtained. It has been demonstrated that

they at times may lie so close to the front of the vertebral column that they may erode the bone, and that in those cases symptoms were present pointing conclusively to the spine as the seat of a lesion. It is seemingly not necessary that the glands should actually erode the column in order to give rise to symptoms, because cases are on record where the glands were in evidence and spinal symptoms were present, though no sign of vertebral erosion could be obtained. In the course of the recovery of the case clinical evidences of the existence of glands disappeared, and synchronously with that spinal symptoms could not longer be detected. Treatment is largely constitutional. Prognosis is in the main good.

The following cases are more or less typical of the condition in question.

Case I.—Mr. T., thirty years. Diagnosis, tuberculosis of abdominal lymph-nodes and tuberculosis of the astragalus. Recovery.

Up to two months before seeking treatment the patient had been perfectly well. First complained of pain in back and abdomen. Motions involving the spine were painful, and the patient soon became conscious of limitation in motions of the back. When examined, there was rigidity of the spinal muscles and obliteration of the lumbar curve, no anteroposterior deformity. Abdominal muscles were quite rigid, but at first there were no glands detectable and no mass could be felt in the abdomen. Later on a definite abscess could be palpated in the right groin. This was opened outside the peritoneum and drained for some months. Inoculation tests proved this to be tuberculous. Shortly after this extensive osseous disease developed in the astragalus, and this bone was excised. Spinal symptoms continued for over two years, during which time a jacket was worn. No kyphos developed.

Case II.—Miss J. B., twenty-six years. Diagnosis, tuberculosis of the lungs, knees, and retroperitoneal glands. Pott's disease.

When a young girl, the patient had signs pointing to pulmonary tuberculosis. These subsided, and for several years she has had no trouble in this region. Nine years ago had an excision of the right knee. Eight years later acute signs developed in the left knee, and an exploratory incision was made into this joint, and erasion of extensive tuberculous disease was practised. Six months ago the patient first complained of pain and stiffness in the lower spine. There was no deformity present, but considerable spasm of muscles and gradually a slight prominence of two or three low dorsal and lumbar vertebræ was noticed. A swelling subsequently became apparent in the right thigh, and at the same time there was considerable pain referred to the front of the thigh. A mass could be felt in the right groin. This proved to be an abscess, and communicated with the abscess in the abdomen. It was aspirated through the thigh, and three quarts of tuberculous appearing pus was drained. Palpation of the abdomen elicits considerable rigidity of the abdominal muscles, but no glands can be positively felt. The kyphos has practically disappeared, and with a leather jacket the patient gets about very well.

Case III.—Mr. L., thirty-five years. This patient was treated at first for a non-tuberculous disease of the spine, seemingly of the hypertrophic

type. He wore a jacket for some months, and returned to his home in Canada. After remaining there one year he returned in poor condition and had a very large abscess which fluctuated both above and below Poupart's ligament. This was aspirated, and a large amount of tuberculous pus was evacuated. Ten days later he developed very acute intestinal symptoms and was operated for intestinal obstruction. The patient died, and at the autopsy there were found many enlarged lymph-glands matting the intestinal coils together and holding the gut close against the lumbar spine, in consequence of which the disease in the glands had extended to the lumbar vertebræ and eroded two of them. The glands were calcified in some instances, and seemed to represent the oldest lesion.

Case IV.—Mr. M., twenty years. This patient was a healthy young man employed in the navy yard. He first complained of pain in the lower back and lameness. This was in the winter of 1897. He became considerably bent over, and was obliged to give up work. When examined at that time there was flexion of the trunk, rigidity of the lower spine, no kyphos, spasm of the abdominal muscles, and on palpation of the abdomen there was distinct fullness and resistance in both groins. This fullness was caused by glandular masses which were nodular in feel. The patient emaciated rapidly, and was much troubled by constipation. Exploratory incision was advised, and performed by Dr. Wm. Conant. The intestines were pushed up into the upper abdomen, and the entire region below them was occupied by a mass of glands, most of which were discrete, but many were matted together and had commenced to caseate. Subsequently these broke down in four places, and sinuses developed in both loins and both groins. These discharged pus freely for many months, and did not wholly close for two years. Four years later the patient was seen and there was no sign of any limitation of spinal motion. The abdomen was soft, the sinuses were closed, and the patient seemed in perfect health. When he was at his worst his weight had fallen to below 100 pounds, but when last examined he was weighing 180 pounds.

Case. V.—Mr. Z., thirty-one years. In the winter of 1906 this patient came to the clinic complaining of pain in the lower back and hips. This had been of gradual development. He carried himself stiffly, but stood erect. His spinal motions were all guarded, and the normal curves of the spine were obliterated. Spinal motions painful. Patient seemed sick and was carrying a degree and a half of fever. A plaster jacket was applied, which relieved his pain very promptly. He seemed much better during the next month, but as the spinal stiffness did not change, a new jacket was applied, and while wearing this he was suddenly seized by acute abdominal pain, which had been preceded by more or less pain and constipation. When the jacket was removed, the abdomen was found to be quite rigid and tender, but nothing else could be made out. Patient was admitted to the surgical service, and when the abdomen was opened, it was found that the coils of intestine were glued together, and the mesentery was full of small glands. The spine seemed entirely normal, so far as it could be palpated from the abdominal side. His convalescence was uninterrupted. The spinal rigidity lessened, though it did not wholly disappear, and there were no further symptoms while he was under observation.

Case VI.—Mr. P. B., twenty-five years. This patient was a strong,

healthy student who commenced to complain of pain in the lower back and right side in the spring of 1901. Shortly after this the trunk commenced to list to the left, and a mass appeared in the right side of the abdomen, a little to the right of the median line. As this increased in size it was aspirated. Pus from this was inoculated in a guinea-pig and produced typical tuberculous lesions. Under the use of jackets and braces the list of the body was gradually righted. The sinus closed in a few weeks, and the patient's pain gradually disappeared. Two years after the commencement of the trouble there was a slight prominence of one or two spinous processes, and an *x*-ray showed a sharply localized erosion on the side of the body of one vertebra.

Case VII.—Mr. L., twenty-seven years. This young man came to the hospital complaining of sharply localized pain in the lower back on the left side. This has been troubling him about three weeks. Previous to the commencement of this he had regarded himself as entirely well. When he was first examined, there was no spinal limitation and only a tender area the size of a twenty-five-cent piece just to the median side of the left posterior or superior spine. In the course of a couple of weeks a swelling appeared here. He was then admitted to the hospital and operated. This swelling represented an abscess which came up from the pelvis. It appeared to be tuberculous. The wound became an extensive ulceration, which only slowly closed in. His spine became stiff in the lumbar region. The muscles of the abdomen were rigid, and on the right side there seemed to be a palpable mass which was tender to pressure. He was treated in the hospital for a long time with mixed toxins of tuberculosis and the streptococcus, but soon developed signs of phthisis and later of miliary tuberculosis and died. No autopsy was permitted. No kyphos developed at any time, and there was nothing to suggest osseous disease.

Case VIII.—Mr. C., nineteen years. This patient came to the hospital complaining of pain in the left lower back, and a limp due to left psoas contracture. On examination the lumbar spine was rigid and the trunk was listed to the left. There was a mass to be felt in the left side of the abdomen. The left leg could not be completely extended, but except for this there was no limitation in the motions at the hip-joint. The patient was put to bed and traction applied to the hip in order to overcome the flexion. There was no kyphos in the spine. The abscess in the abdomen was drained through the groin, and later two or three fistulæ appeared spontaneously in the left and one in the right loin. For about a year the general condition was bad, and the patient's recovery seemed doubtful. Within three years of the time the trouble commenced he had improved to such an extent that the sinuses had all healed, the spinal motions had been restored to normal, and there was no longer any abdominal rigidity. At no time was there a kyphosis in this case.

As will be noted in reading the accounts of these cases, there is no absolute proof in any but one or two of the patients that the spinal symptoms were caused by the presence of glands of a tuberculous nature, so situated that they pressed upon and eroded the vertebral bodies, yet the symptoms in these cases, when the positive proof of spinal erosion is lacking, are so

similar to those noted in the case where demonstration of this osseous lesion was possible that it seems reasonable to conclude that they all belong to the same class.

DISCUSSION.

Dr. Wisner R. Townsend (New York) said he appreciated the importance of these conditions which simulated spinal disease, and he thought the Boston school of orthopedics deserved a great deal of credit for bringing forward more information on these subjects. It seemed to him that the most important thing they had done in the last few years in regard to spinal lesions was in having made it possible more clearly to differentiate the symptoms. It was unfortunate, in this class of cases, that an early diagnosis often could not be made. But it was a very good thing to call attention to the fact that these conditions did exist, and that they were not so uncommon as had generally been supposed. A great many escaped observation entirely, being treated as lumbago, etc., whereas in reality they were the beginning symptoms of a more serious condition.

Dr. Charles H. Dowd (New York) asked what experience they had had in the removal of the mesenteric glands in these mild cases. He had had the experience, in the well-marked cases of tabes mesenterica, and had been very much surprised to find how easy it was to remove large masses of these nodes and to get a good healing. He had not had any experience, however, in operating on the class of cases referred to in the paper. Surgery surely offered a very promising field of treatment for this condition, and he wished to know whether the writer of the paper had operated upon any of the cases.

Dr. Painter, in closing, said that a good deal of work had been done on the aggravated form of these mesenteric enlargements, but he had not operated on any of the cases of the milder type. He had been unable to persuade surgeons as to the advisability of making laparotomies in these cases. On the other hand, he had seen some very serious cases, which the surgeons had considered hopeless, and in which spontaneous recovery took place. Therefore, the determination of what cases should be subjected to surgical treatment was still an open question.

SURGICAL ASPECTS OF TUBERCULOSIS OF THE LUNG AND PLEURA.

By Samuel Robinson, M.D.,
Boston.

Surgery may well boast of increasing successes in certain regions of the body, but within the chest cavity progress has indeed been limited. Furthermore, for the results of operative treatment of tuberculosis of the lung and pleura, surgery may claim even less credit.

Ten years ago J. B. Murphy, of Chicago, in a surgical oration reviewed the status of lung surgery at that time. Abscess of the lung, actinomycosis, bronchiectasis, gunshot wounds, and foreign bodies, thanks to a goodly number of collected results, he regarded as conditions warranting surgical treatment. During the past ten years the number of such operations has increased with proportionately somewhat better results, thanks to the work of Carre, Karewski, Korte, Tilton, and others.

But despite the hopeful results of such intrathoracic operations, we must on this occasion adhere to the treatment of tuberculous lesions, and in 1898 Murphy was evidently of the opinion that, up to that time, surgery had been of comparatively little benefit in the treatment of pulmonary tuberculosis. Cases of drained tuberculous cavities were then, as now, in the literature, but Murphy was doubtless correct in stating that this procedure was attended with uncertainty. The opening of one cavity often meant that one or more neighboring ones were left unoperated. The results in certain cases, however, were relief to the patient in diminished expectoration and cough. Nor did Murphy abandon the advisability of operating in certain favorable cases where such improvement was promising. A review of the results of partial excision of pulmonary tuberculous foci, partial pneumectomy, was then most discouraging. Murphy, in the same oration, advocated the injection of nitrogen into the pleural cavity to partially collapse, and thus immobilize, the diseased lung.

Ten years have elapsed since this review; what more can be claimed today in behalf of the surgery of tuberculous intrathoracic lesions?

The drainage of tuberculous cavities is still undertaken, but, it must be admitted, with the same uncertainty as to relief—with much the same dangers as to convalescence—and with quite as little hope of cure. For the relief of symptoms in certain cases its value cannot be denied.

As to the results of excisions, the literature of the past ten years contributes little encouragement. The cases of Tuffier, Lowson, and Doyen still stand practically alone as successful excisions of tuberculous lung-lobes. As a result of considerable animal experimentation, I have come to regard the removal of one or two lobes of the lung of a dog or rabbit as an operation attended with absolute surety of success. Mayer, Green, and Janeway would, I think, support me in this conviction, and although our experimental successes in the last few years tend to undue hopefulness for lung excisions in the future, it is difficult to abandon the possibilities of such operations on tubercular foci as willingly as we abandoned them ten years ago. It must be conceded, however, that pneumectomy in the human lung in the presence of adhesions is quite a different problem from the same operation in the normal animal. Professors Brauer and Sauerbruch, of Marburg, men of considerable clinical and experimental experience, have recently courteously answered my personal inquiries on this subject; they are of the opinion that the excision method of approaching pulmonary tuberculosis offers little encouragement for the future.

Clinical progress has, however, been marked in one direction at least. Like other tubercular lesions, where excision is not possible, rest of the diseased part leads to relief and often to cure. I refer to the different methods of collapsing the lung, and thus, as it were, splinting it. The plastic operations of Estlander and Schede have long been utilized for obliterating the chest cavity in cases of chronic empyema. Garré, Quincke, Friedreich, Kuttner, and others are now utilizing similar plastic operations to collapse and immobilize the tuberculous lung. In the previously ascertained absence of adhesions, prolonged but not permanent collapse of the lung is produced by the injection of nitrogen into the pleural cavity, as suggested by Fallonini and Murphy. By repeated injections of this slowly absorbed gas a partial splinting is maintained, in which time, as Rudolph Brauer emphasizes, the absorption of toxins is diminished by the lessened lymph circulation; the tubercle bacilli thrive less successfully and decrease in the sputum; expectoration is diminished, and the night-sweats cease.

In early apical tuberculosis cures have been claimed after Freund's operation, developed by Seidel, in which by mobilizing the first rib, the excursion of the upper thorax is increased and the apices are rendered less prone to inactivity and bacterial invasion.

Furthermore, most surgical clinics record successful results in drainage and plastic operations for the relief and cure of tuberculous empyema, and if we accept the statement that 85 per cent. of all adult empyemas are of tuberculous origin, surgery may claim even further contributions.

Lacking in brilliancy as our surgical clinical results may yet be regarded, we have not been unmindful of the need of experimental investigation, and

the past ten years have witnessed distinct endeavors in this direction. The experimental successes of Biondi, Gluck, and Schmidt in 1882, and thereabouts, were followed by renewed clinical enthusiasm and apparent experimental satisfaction. The clinical hopes aroused by the results of these experiments were not realized in the following twenty years. The past ten years mark renewed experimental work, and the clinical wave of enthusiasm is, I think, again starting. Continued experimental and clinical coöperation is now to be hoped for.

In 1904 Sauerbruch described his negative pressure cabinet for the prevention of lung collapse in intrathoracic operations. With this apparatus we are all familiar. Then followed improvements in the older methods of artificial respiration. Brauer, Mayer, Seidel, F. T. Murphy, Green, Murray, and Robinson have introduced various forms of apparatus for the use of compressed air in preventing lung collapse—the positive pressure method.

With the use of one of these pressure-difference methods many animal operations have been successfully performed. The operations on man under negative and positive pressure, though watched with increasing interest, have yet been too few from which to draw comparison between results with and without apparatus.

Most surgeons have seen the human pleural cavity opened wide in the absence of artificial inflation, without seeing the onset of dyspneic symptoms. Many have also seen grave symptoms arise which lead to fatality either during or soon after the operation. Many of both classes of cases are recorded in the literature. In other words, no man can prophesy the probable resistance of a given patient to the effects of lung collapse; in fact, Parascandelo even ventures to state that it is a matter of idiosyncrasy of the patient. Petit and others have expressed lack of sympathy with the recent interest in the use of pressure-difference methods, but it remains for them to prove that some of the intrapleural operations which have resulted fatally would not have terminated otherwise if the lung collapse had been avoided by the use of some apparatus. Even should my opinion prove erroneous, that eventually some simple form of positive pressure apparatus will be used in most pulmonary operations, nevertheless the advances made experimentally in this connection have contributed much to the further development of lung surgery, for reasons which I will endeavor to point out.

The animal best suited for experimental thoracic surgery is the dog. A large opening in the chest of this animal results within a few seconds to four minutes in death. Before the development of these improved apparatus for artificial inflation the best experimental investigations reported were done without apparatus. An Italian, Biondi, accomplished surprising results by drawing the lung out of the chest through a small opening, thus blocking the entrance of air as much as possible, and operating on the lung

and its root extrathoracically. A technic was thus recommended which in the normal animal was moderately successful. I have at times experimented on dogs and rabbits in this way, and have experienced Biondi's difficulties in having to apply constant artificial respiratory pressure on the chest and epigastrium. Blood-pressure tracings taken at the time demonstrated the great reflex depression from traction on the lung root, threatening the animal with collapse. To perfect the surgery of the human chest, in which the presence of adhesions often renders the delivery of the lung impossible, an intrathoracic technic is essential. Traction and manipulation, furthermore, are as much to be avoided as on the intra-abdominal organs. To operate intrathoracically and thus avoid these dangers, the pleural opening must be large and wide, especially to reach the lung root.

The perfected positive pressure methods have given us means of preventing lung collapse, at least in animal experimentation, and from operations within the chest a new intrathoracic technic has been developed. The chest opening may, as suggested by Mikulicz, be made ample by separating the ribs with a spreader introduced in a long intercostal incision. Such an opening is large enough to admit a hand for complete exploration of one half of the pleural cavity; large enough, also, for thorough and painstaking operating on the thoracic viscera.

Thoracic surgery in animals being deprived of its dangers by the use of apparatus, numerous pulmonary operations have been performed by experimenters, and although pneumectomy of greater or less portions has been the popular operation, much has been learned in this connection which improves the technic of chest surgery for operations other than excisions.

Talke has shown experimentally the processes of repair of lung-tissue after operation as well as technical measures to assure the best healing.

Mayer, of Brussels, from a long series of operations on the dog, has thrown light on the dangers of air embolism and thrombosis.

Greene and Murray, of New York, and Tiegel have demonstrated the success of several methods of closing the incised lung tissue.

Friederich, through animal experimentation, points out the importance of accuracy and thoroughness in the treatment of the amputated bronchus.

Sauerbruch has investigated the cause of serious symptoms of pneumothorax and has devised the negative pressure cabinet to avoid them.

My own experiments have been devoted to the improvement of technic of intrathoracic operating, to the effects of traction, incision, compression, and excision of lung tissue, both as to pathology and blood-pressure. In addition to sixty operations and experiments for the above purpose, G. A. Leland and I have recently completed a series of fifteen operations on rabbits without the use of apparatus. Total lung excisions were accomplished through wide openings. Of the last ten animals operated, eight are now

living and well. The lack of pneumothorax symptoms in the rabbit, which are fatally present in all dogs operated without apparatus, leads to an investigation of the comparative structure and anchorage of the mediastinum in the dog, rabbit, and human being. Thus I hope to throw further light on the cause of fatal pneumothorax.

In conclusion, then, I would say that despite the discouraging clinical results of pulmonary surgery, even to the present day, the experimental perfecting of pressure apparatus to meet the undoubted needs of certain cases, and the experimental improvement in the general technic of operations within the chest, justify hope that surgery soon may approach, more skilfully, tuberculous cavities and tubercular empyema, though lung excision may never prove an advisable procedure; and, furthermore, that by pleural incision the technic of nitrogen injection may be spared the dangers of trocar puncture, and that plastic operations for the splinting of the lung may, with the help of a pressure-difference apparatus, be done more thoroughly and with less danger to the patient.

DISCUSSION.

Dr. Emil G. Beck (Chicago): The future of surgical treatment of the chest is promising. Only recently I have been shown the specimens and the results from experiments on dogs by Dr. Opie, at the Rockefeller Institute of New York. These experiments indicate that the treatment, by injection of white blood-corpuscles into the pleura of dogs which had been infected by tuberculosis, has great possibilities. I have likewise been able to demonstrate on patients that tuberculous empyema is amenable to the treatment of bismuth paste injections, and I believe that tuberculous pleurisy, which is, in most cases, an early complication of tuberculosis of the lung, is likewise amenable to the same treatment.

Dr. H. Berlin (Chattanooga, Tenn.) said we had been able to do something with negative pressure, and if we could get a positive pressure apparatus that was successful, he thought we would be able to do much more. Lung abscesses have been opened by this method successfully, but what could we expect from surgery in a general tuberculosis of the lung? We might be able to remove one or even two lobes of a lung, as had already been done in animals, but in what way would it benefit the patient with general tuberculosis to have this done?

Dr. Robinson said he thought surgeons often credited men doing experimental work with undue enthusiasm, and were inclined to believe that the same results obtained in animal experimentation could be gotten in the human subject. Some surgeons had said to him that they had opened the pleural cavity without any apparatus, and they did not see the need of apparatus. He thought such men believed that he gave undue credit to

the apparatus method. Although many operations had been done without apparatus, there was no way of telling whether the patient would collapse on opening the pleural cavity, and it seemed to him that it was our duty at least to have ready some form of apparatus to prevent that collapse. The rabbit experiments had been very gratifying. In the first 30 operations on dogs the operations consisted in removal of a greater or less portion of the lung, and out of the 30 operations there were 21 recoveries. The deaths were largely in cases where an attempt had been made to remove the entire right lung. In these operations it was absolutely necessary to have the apparatus going. If it broke, the animal went to pieces at once. By pulling the lung into the opening in the chest-wall the symptoms of collapse could be arrested. A great deal of the surgery of the chest in the last fifty years had consisted of this procedure. In his experiments with rabbits he had first begun pulling the lung out through a small opening, but the lung tore at once, because of its delicate structure. Then a wide and long intercostal incision was made, a ligature was put around the lung root, and it was then amputated. After two operations, one day the apparatus did not work very well, and the animal seemed to do just as well. After that the apparatus was discarded. The animals were etherized, and the chest opened widely. There was no sign of dyspnea during an operation lasting an hour and a half. In the first few he was not familiar with etherizing the rabbits, and he lost some of them on that account, but of the last ten operated on, eight were still alive. The question was, "Which do the human tissues most resemble, those of the rabbit or those of the dog?" He was convinced that the disastrous result in dogs was due to the mobility of the mediastinum, which was not the case with the rabbit. In the rabbit the heart seemed to occupy a greater portion of the mediastinum than was the case in the dog.

Los Aspectos Quirúrgicos de la Tuberculosis de los Pulmones y de la Pleura.—(ROBINSON.)

En cuanto á los progresos en la curación y prevención de la tuberculosis, la Cirugía ha hecho muy poco ó nada en este punto. No solamente es la cirugía intratorácica caracterizada por un progreso lento en comparación con la cirugía de las otras partes del cuerpo, sino que los resultados de las operaciones de las lesiones tuberculosas en la cavidad del pecho, han sido tan poco satisfactorias, que no dan sino una esperanza limitada al operador de invadir esta región.

La literatura nos demuestra los resultados poco favorables en la evacuación de las cavidades tuberculosas por medio de la toracotomía, las condiciones generales del paciente han sido tal vez temporariamente mejoradas, mas el curso de la enfermedad ha sido raramente detenido. Se sabe de casos

en los cuales la neumectomía parcial ó completa ha abreviado la vida del paciente, bien debido al efecto immediato de la operación, á la existencia de neumotórax después de la operación ó bien al colapso del pulmon opuesto debido á lesiones del mediastino. En aquellos pocos casos en los cuales la operación se ha considerado favorable, una terminación fatal ha sido el resultado debido al aumento y diseminación de la enfermedad à los lóbulos restantes del lado operado y á trasmisión del material infectado al lado opuesto.

El Siglo Veinte ha ya presenciado un avance en la técnica de la cirugía intratorácica por medio de la introdución del método de la presión negativa evitando así los peligros del neumotorax y también por mèdio del perfeccionamiento del método de la presión positiva para evitar estos peligros. Las investigaciones de Sauerbruch, Brauer, Matas, Smithe, Greene, Janeway, Mayer, Tuffier, Seidel y las del autor, han demostrado que una toracotomia exploratoria, á la ayuda de los nuevos métodos presenta tan pocos peligros como una laparotomía exploratoria. Los investigadores mencionados estarán también de acuerdo en que la extirpación parcial ó completa de una ó dos lóbulos de cualquiera de los pulmones es una operación de poco peligro para el paciente. Este última conclusión está basada principalmente en los experimentos hechos con los animales, mas es bien sabido que el pulmón del hombre está menos espuesto a la infección y es menos suceptible á los peligros del neumotorax que la mayor parte de los animales usados en los experimentos. El mediastino del hombre es comparativamente una estructura inaccesible, las condiciones del lado opuesto á la operación no son tan desfavorables como lo son en el perro.

Dado el caso de estos nuevos procedimientos justificables en la toracotomía exploratoria ó neumectomía parcial, que se puede decir en cuanto al éxito de la cirugía en la tuberculosis pulmonar? Un número insuficiente de casos han sido operados por los nuevos métodos para poder sacar de ellos una conclusión definida. Por desgracia los casos mas apropiados para el tratamiento operatorio, son aquellos en los cuales por lo general los mismos resultados favorables pueden obtenerse por medio del tratamiento higiénico. Yo me refiero á aquellos casos de focos aislados y limitados á uno ó dos lóbulos del pulmón. Por medio de los rayos X, tales casos son fácilmente reconocidos aún antes de que los signos físicos sean diagnosticables, mas tales casos no llegan a las manos del médico sino es hasta despues de haber recurido al tratamiento general. Habiedo fracasado en el tratamiento general, debido á la extensión de la infección, el caso es menos adecuado á la escision de la área afectada, ademas hay el peligro de la extension de la affeción á los otros lóbulos ó bien la trasmisión directa del material infectado al lado opuesto.

En otras palabras, no puede decirse que la tuberculosis del pulmon

está fuera del alcance del cirujano, mas el problema queda por resolverse si el drenage ó escisión del foco tuberculoso en la cavidad torácica pueda producir la desaparición de la infección. Es de espararse á la menos que el tratamiento por medio de la vacuna y las medidas higiénicas, despues de la evacuación del material infectado por medio de la operación lleguen á dar mejores resultados.

Die Aussichten für chirurgische Behandlung der Tuberculose der Lungen und der Pleura.—(Robinson.)

In Bezug auf die Fortschritte in der Behandlung und Verhütung der Tuberculose kann die Chirurgie sehr wenig oder gar keine Ansprüche auf Verdienste machen. Nicht nur ist die Geschichte der Brusthöhlen-Chirurgie durch einen langsameren Fortschritt als die Chirurgie irgend einer anderen Region des Körpers ausgezeichnet, sondern auch in Bezug auf Läsionen innerhalb der Brusthöhle selbst haben sich diejenigen von tuberculöser Beschaffenheit besonders hinsichtlich chirurgischer Eingriffe unzufriedenstellend gezeigt. Es ist deshalb sehr wenig ermuthigend für den Operateur, sich an diese Region heranzuwagen.

Die aus der Literatur bekannten Fälle von Drainirung tuberculöser Höhlen durch Thoracotomie sind ziemlich entmuthigend. Die Kranken fanden allerdings zeitweilig Erleichterung, aber nur selten konnte die Krankheit zum Stillstand gebracht werden. Es sind einige Fälle von partieller oder totaler Pneumectomie veröffentlicht, in denen das Leben der Kranken abgekürzt wurde, entweder durch Schlag von der Operation, oder durch Bildung eines Pneumothorax nachdem die Brust geschlossen wurde, oder durch Collabirung der Lunge, an der nicht operirten Seite, durch Verwundung des Mediastinums. In den wenigen Fällen, wo der operative Eingriff als erfolgreich bezeichnet werden könnte, wurde ein tödtlicher Ausgang durch Verstärkung und Ausbreitung der Krankheit in den zurückgebliebenen Lappen an der geöffneten Seite und durch Übertragung des Infectionsmaterials auf die andere, nicht operirte Lunge beobachtet.

Ein weiterer Fortschritt in der Technic der intrathoracalen Chirurgie ist bereits in unserem (zwanzigsten) Jahrhundert erfolgt durch die Einführung der Methode des negativen Druckes zur Vermeidung der Gefahr des Pneumothorax, und durch Vervollkommnung der Methode des positiven Druckes um dieser Gefahr vorzubeugen. Die Untersuchungen von Sauerbruch, Brauer, Matas, Smythe, Greene, Janeway, Mayer, Tuffier, Seidel und meine eigenen haben bewiesen, dass die nach den neuen Methoden zu Untersuchungszwecken ausgeführte Thoracotomie mit keiner grösseren Gefahr verbunden ist, als die zu demselben Zwecke ausgeführte Laparotomie

Die genannten Forscher würden auch darin übereinstimmen, dass eine partielle oder vollständige Entfernung von einem oder zwei Lappen einer Lunge als eine Operation angesehen werden kann, die mit wenig Gefahr für den Kranken verbunden ist. Dieser Schluss ist hauptsächlich auf Thierversuche gegründet, aber es ist eine bekannte Thatsache, dass der menschliche Thorax viel weniger zu Infection geneigt ist und weniger der Gefahr eines Pneumothorax ausgesetzt ist als es bei den meisten der Versuchsthiere der Fall ist. Da das menschliche Mediastinum von verhältnissmässig nachgiebigerer Beschaffenheit ist, so liegen die Verhältnisse in Bezug auf die nicht geöffnete Seite des Thorax nicht so ungünstig, wie es z. B. beim Hunde der Fall ist.

Wenn wir nun auch die neuen Eingriffe der Thoracotomie für Untersuchungszwecke oder für partielle Pneumectomie als berechtigt anzusehen haben, so entsteht weiterhin die Frage: Was können wir über die Aussichten chirurgischer Eingriffe bei Lungentuberculose voraussagen? Seit der Vervollkommnung der neuen Methoden war leider die Zahl der Fälle, die zur Operation gelangten, zu ungenügend, um daraus irgend welche Schlüsse zu ziehen. Es ist auch zu bedauern, dass solche Fälle, die sich für chirurgische Eingriffe am besten eignen würden, eben auch diejenigen sind, bei denen man sich von einer hygienischen Behandlung ebenfalls die meisten Erfolge versprechen kann. Ich habe hier diejenigen Fälle im Auge, wo wir es mit isolirten Heerden, auf einen oder zwei Lungenlappen beschränkt, zu thun haben. Mit Hülfe der X-Strahlen können solche Fälle diagnosticirt werden, lange vorher, ehe irgend welche physikalischen Zeichen zum Vorschein kommen, aber der innere Mediziner wird lange zögern, ehe er diese Fälle dem Chirurgen zur Behandlung überlassen wird, ohne vorher eine allgemeine Behandlung versucht zu haben. Hat sich letztere mit der Zeit als erfolglos erwiesen, so hat sich dann auch der Fall unterdessen aber zu einem weniger geeigneten für eine totale Entfernung des Krankheitsheerdes gestaltet, weil mittlerweile eine Ausbreitung der Infection, ein Mitangegriffensein der anderen Lappen, und sogar vielleicht eine Übertragung der Krankheit auf die andere Lunge stattgefunden hat.

Mit anderen Worten, es kann jetzt nicht mehr mit Recht behauptet werden, dass die Tuberculose der Lungen und der Pleura sich ausserhalb des Bereiches der Chirurgie befindet, aber die Frage bleibt noch offen, ob durch Drainirung der Brusthöhle oder durch Entfernung von tuberculösen Heerden aus derselben jemals die Infection selbst entfernt werden kann.

Indessen ist wenigstens die Hoffnung vorhanden, dass die Krankheit durch Impfung und hygienische Behandlung mit mehr Erfolg würde bekämpft werden können, wenn gleichzeitig etwa bestehende grössere Ansammlungen von Infectionsmaterial von dem Chirurgen entweder drainirt oder entfernt worden sind.

DIE CHIRURGISCHE BEHANDLUNG DER LUNGEN-TUBERKULOSE.

Von F. Sauerbruch,
Marburg, Deutschland.

Die Versuche, auf chirurgischem Wege die Lungentuberkulose in Angriff zu nehmen, datieren seit Moslers (1873) parenchymatösen Injektionen von Carbol- und Salicylsäure in die Lunge. Derselbe Autor eröffnete dann auch mit Hueter, als erster, eine bronchiectatische, tuberkulöse Caverne. Demnach war Mosler der erste, der eine chirurgische Behandlung der Tuberkulose in das Bereich der Möglichkeit zog. Diese Versuche aktiver chirurgischer Therapie fanden sehr wenig Anerkennung, und wurden nur von wenigen nachgemacht. Man hatte eben gelernt, die Tuberkulose nicht nur als ein lokales, durch das Eindringen von "Keimen" an bestimmten Stellen hervorgerufenes Leiden anzusehen, sondern als eine mehr oder weniger ausgebreitete Allgemeinerkrankung.

Moslers Vorgehen beruhte dagegen auf der Vorstellung, dass es gelingen müsse durch Injektion antiseptischer Flüssigkeiten, wie Carbol- und Salicylsäure, die in den Lungengeweben sitzenden Injektionserreger abzutöten. Ähnlich wie Mosler hat dann später W. Pepper Jodkalilösung und, nach der Entdeckung des Tuberkelbazillus, Iodoformöl eingespritzt. Wir wissen heute, dass eine Wirkung von solchen Injektionen nicht erwartet werden kann. Die Erfolge dieser Behandlung waren sehr gering. Einigemale erfolgte Verminderung der Sekretion. In den meisten dieser Fälle konnte aber diese Besserung nicht konstatiert werden.

Den zweiten Anstoss, die erkrankte Lunge auf operativem Wege zu heilen, gaben dann im Jahre 1881 die Versuche von Gluck, H. Schmidt, Block, denen es gelang, an Tieren Teile der Lunge zu resezieren, ja sogar die Lunge einer Seite zu extirpieren mit vorübergehender Erhaltung des Lebens der Tiere.

Biondi baute auf diesen Versuchen weiter, impfte bazillenhaltiges Material in die Lungen der Tiere, und erzeugte so eine Tuberkulose der Lunge, welche eine Zeit lokal blieb. Diese lokale Tuberkulose beseitigte er dann dadurch, dass er die kranke Lunge extirpierte. Er konnte bei einzelnen Tieren, die nicht an den direkten oder indirekten Folgen der Operation

starben, beobachten, dass mit der Entfernung der erkrankten Lunge die Tuberkulose aus dem Körper beseitigt war.

Der Erste, der dann auch beim Menschen die Resektion erkrankter Lungenabschnitte versucht hat, war der Amerikaner, Block; bald darauf folgte ihm Ruggi; der Ausgang dieser Operationen war schlecht—die Patienten starben.

Tuffier hat später einen nussgrossen, tuberkulösen Herd der rechten Lungenspitze, ohne Eröffnung der Pleura, und ohne Rippenresektion durch den zweiten Intercostalraum hindurch excidiert. Der Patient war noch nach vier Jahren gesund. Reclus citiert noch vier tötlich verlaufene Fälle, Doyen einen geheilten, bei welchem er ein kleinfaustgrosses Stück der Lunge entfernt hatte.

Auch Sonnenburg, der die Mosler'sche Injektion mit der Resektion verband, hatte wenig erfolgreiche Resultate.

Ein anderes Ziel hatten die Arbeiten von Koch, Rochelt, Tuffier, Kurz, Reclus, und Quincke. Sie beschäftigten sich mit der Behandlung derjenigen Formen der Tuberkulose, bei denen es zu Cavernenbildung gekommen war, und wo die Stagnation des Secretes in der starrwandigen Höhle im Vordergrund des Krankheitsbildes stand. Das gegebene Verfahren war die operative Eröffnung der Caverne und Drainage derselben. Aber von 27 von Tuffier im Jahre 1897 zusammengestellten Fällen hat allein einer, ein von Sonnenburg 1891 operierter und gleichzeitig mit Tuberkulin behandelter Patient, den völligen Dauererfolg erzielt.

Nach einer zweiten Zusammenstellung von Rouenberg und einer weiteren von Lopez sind noch 19 derartige Cavernenöffnungen vorgenommen worden, aber alle nur mit vorübergehender Besserung; alle sind letal verlaufen.

Prinzipiell andere Unterlagen haben dann Quincke und Spengler für die operative Behandlung starrwandiger Cavernen geschaffen. Ihre Methode stützt sich auf die pathologisch-anatomische Tatsache, dass tuberkulöse Lungenherde bei der natürlichen Heilung durch Schrumpfung und Narbenbildung verschwinden können.

Schon 1888 (Berliner klinische Wochenschrift, Nr. 18) schlug Quincke vor, bei tuberkulösen Höhlen der Lunge die nächstliegenden Teile der Brustwand zu entfernen, dadurch die Lunge zu mobilisieren, und auf diese Weise eine Narbenretraktion zu ermöglichen. Quincke selbst hat diese Operation nicht ausgeführt. Zu ähnlichen Überlegungen kam, unabhängig von Quincke, Spengler. Dieser Autor konnte sogar auf dem Naturforschertag in Bremen 1890 bereits über einen günstigen Erfolg dieser Behandlung berichten; 1894 operierte dann auch Bier bei einer isolierten Lungencaverne der rechten Spitze nach dieser Methode, d. h. mit der Absicht, durch ausgiebige Mobilisation der Brustwand eine dauernde Schrumpfung der Lunge herbeizuführen. Ferner haben Turban und Landerer durch ausgiebige

Rippenresektion die Brustwand nachgiebig gemacht, und durch dieses Vorgehen Besserungen erzielt. Ich selbst assistierte, 1904, v. Mikulicz im Sanatorium von Turban als er auf dessen Indikation eine vernehmlich einseitige Lungentuberkulöse operierte. Mikulicz machte eine grössere Thorakoplastik (Resektion von 5 oder 6 Rippen). Trotz Verletzung des Brustfelles überstand die junge Patientin den Eingriff, lebte allerdings nur noch dreiviertel Jahre, bis sie an ihrer Tuberkulose zu Grunde ging.

Eine andere Methode, die Tuberkulose durch chirurgische Massnahmen zu behandeln, stammt von Murphy. Er ging von der Vorstellung aus, dass die ruhig gestellte und unter andere Cirkulationsbedingung gebrachte Lunge ganz ähnlich wie ruhig gestellte Gliedmassen eher ausheilen müsste, als die arbeitende. Diese Ruhigstellung suchte er dadurch zu erreichen, dass er unter einem mässigen Druck Stickstoff in die Brusthöhle einblies, einen künstlichen Pneumothorax erzeugte, und dadurch die Lunge zum Collaps brachte.

Nach Murphy hat der Italiener Forlanini an einer grösseren Zahl von Patienten das Verfahren erprobt, und über günstige Erfolge berichten können.

In Deutschland hat Brauer ganz besonders dieses Verfahren ausgearbeitet, und an einer grossen Anzahl von Patienten die Leistungsfähigkeit desselben erwiesen.

Das ist in kurzen Umrissen die Geschichte der Entwicklung der Chirurgie der Lungentuberkulose. Abgesehen von den letzten Versuchen, "Pneumothorax und Thorakoplastik," auf die ich noch ausführlich zu sprechen komme, sind alle Bemühungen, die Lungentuberkulose chirurgisch zu beeinflussen, wenig erfolgreich gewesen. Aber insofern haben sie Früchte getragen, als sie uns die Grenzen zeigten innerhalb deren überhaupt der Versuch einer operativen Therapie gerechtfertigt erscheint.

Für eine richtige Beurteilung des Wertes einer jeden Behandlung der Tuberkulose ist die Tatsache von Wichtigkeit, dass jede Erkrankung, selbst ein umschriebener lokaler Herd, der Ausdruck einer Allgemeininfektion ist. Eine "lokale" Erkrankung ohne gleichzeitige Beteiligung des Gesamtorganismus gibt es nicht. Jede Therapie, auch die operative, muss diese Tatsache durchaus berücksichtigen. Daher soll die chirurgische Behandlung der Tuberkulose immer verbunden sein mit klimatischer und diätetischer Allgemeinbehandlung, mit ihren bekannten mannigfachen Mitteln. Andererseits wissen wir bestimmt dass die Verbreitung und Weiterentwickelung der "lokalen" Tuberkulose durch operative Beseitigung des Hauptherdes sich verhindern lässt. Gleichzeitig erzielen wir dadurch regelmässig eine beträchtliche Hebung des Allgemeinzustandes, und nicht selten eine völlige Ausheilung der Tuberkulose überhaupt. Das zeigen vor allen Dingen einwandsfrei die Erfahrungen mit der chirurgischen Behand-

lung der Knochen- und Gelenktuberkulose. Diese schönen Erfolge haben eine unbedingte Voraussetzung:

Die Durchführung der Operation im gesunden Gewebe.—Wo diese nicht gelingt, weil die Ausbreitung des tuberkulösen Herdes diffus und nicht scharf begrenzt ist, so dass wir selbst durch ausgedehnte Resektion das erkrankte Gewebe nicht radikal entfernen können, da schaffen wir durch sekundäre Mischinfektion, chronische Eiterung und Fistelbildung oft sogar schlechtere Verhältnisse. Der Vergleich der Lungentuberkulose mit der Tuberkulose der Knochen und Gelenke ist naheliegend. Von vornherein lässt sich gegen den chirurgischen Standpunkt, eine umschriebene "lokale" Tuberkulose der Lunge genau so zu behandeln, wie eine isolierte Gelenk- oder Knochentuberkulose, d. h. durch operative Beseitigung des Krankheitsherdes, nichts prinzipielles vorbringen. Voraussetzung ist aber hier wie dort, dass es uns gelingt, die Abtragung des erkrankten Gewebes im gesunden vorzunehmen. So leicht die Wegnahme der erkrankten Partien in den meisten Fällen der Tuberkulose von Knochen und Gelenken gelingt, so schwierig, ja unmöglich, kann bei der Lungentuberkulose dieser Forderung genügt werden.

Wir wissen auf Grund pathologisch-anatomischer Beobachtungen, dass eine "lokale" Tuberkulose der Lungen, d. h. ein scharf umschriebener Herd, der sich vom gesunden sicher abtrennen lässt, sehr selten ist. Wenn überhaupt, so dürfte er wohl nur im Beginn der Erkrankung bei der sogenannten Infiltration der Spitzen beobachtet werden. Alle weiter fortgeschrittenen Fälle mit käsigem Zerfall, oder gar mit Höhlenbildung, sind wohl nur selten auf eine Lunge oder gar einen Lappen beschränkt. Hier kann von einer "lokalen" Tuberkulose demnach sicherlich keine Rede mehr sein. Es würde sich also bei einer radikalen Entfernung eines tuberkulösen Krankheitsherdes in der Lunge nur um die erkrankte Spitze handeln können. Die Frage der Radikaloperation der Lungentuberkulose deckt sich demnach mit der Frage der Resektion der Lungenspitze. Ihre Entscheidung ist in erster Linie abhängig von der Möglichkeit, die Abtragung der Spitze im gesunden vorzunehmen, d. h. so dass sicherlich nicht der geringste tuberkulöse Herd zurückbleibt. Damit habe ich aber schon ausgesprochen, wie selten wir geeignete Fälle finden werden. Trotz unserer verbesserten Untersuchungstechnik, speciell durch das Röntgenverfahren, sind wir nicht in der Lage, vorher genau die Ausdehnung eines tuberkulösen Infiltrates der Spitze festzustellen. Während der Operation selbst gelingt eine zuverlässige Abgrenzung des erkrankten vom gesunden Gewebe erst recht nicht. Die Gefahr, im tuberkulösen Gebiet zu operieren ist also gross, und damit der Erfolg der Operation sehr stark in Frage gestellt.

Auch die Operation selbst ist kein kleiner Eingriff. Die Gefahr der Pleuraeröffnung ist zwar wegen der meist bestehenden Verwachsung nicht gross, und würde bei Anwendung des Druckdifferenzverfahrens nur geringe

Bedeutung haben. Aber die Abtragung der Spitze führt zu Blutung, und die Blutung zu Aspiration, die ihrerseits mancherlei Komplikationen im weiteren Verlauf zur Folge haben kann. Wurde bei der Operation ausserdem noch im tuberkulösen Gewebe operiert, so kann sehr leicht von hier aus eine Propagierung des Prozesses eintreten.

Mit diesen Überlegungen im Einklang stehen die bisherigen Erfolge, die keineswegs ermutigend sind. Karenski berichtet über 10 Fälle aus der Literatur, von denen 3 unmittelbar nach der Operation tötlich endeten. Es sind die Fälle von Block und Ruggi. Hinzu kommen 4 weitere tötlich verlaufene Fälle von Reclus. Diesen 7 Fällen mit unglücklichem Ausgang stehen 3 dauernd geheilte gegenüber. Es sind die Patienten von Tuffier, Lawson, und Doyen. Die Mortalität ist also eine ganz beträchtliche. Drei auf operativem Wege geheilte Fälle von Lungentuberkulosev erschwinden gegenüber der grossen Zahl von Patienten, die jährlich einer regelrecht durchgeführten klimatischen, diätetischen Allgemeinbehandlung ihre dauernde Genesung verdanken. Kein Arzt kann sich der Tatsache verschliessen, dass eine beginnende Spitzentuberkulose, frühzeitig erkannt, auf konservativem Wege, eventuell in Verbindung mit der Tuberkulinbehandlung, grosse Chancen zur Spontanheilung hat. Das lehrt uns unzweideutig die klinische Erfahrung, und das zeigen uns vor allen Dingen die vielen ausgeheilten Spitzenherde, die wir so häufig auf dem Sectionstisch als Nebenbefund in den Lungen von Patienten finden, die an einer anderen Krankheit zu Grunde gegangen sind.

Der Resektion der Lungenspitze würde selbst dann die Berechtigung abzusprechen sein, wenn sie technisch leichter und gefahrlos wäre. Die chirurgische Therapie soll erst dort einsetzen, wo die interne Behandlung versagt, oder wo ein operativer Eingriff mehr leistet, als jene vermag.

Eine prinzipiell andere therapeutische Bedeutung, als die Radikaloperation der Lungentuberkulose, hat die Pneumotomie bei tuberkulösen Cavernen. Sie verzichtet auf eine radikale Beseitigung des tuberkulösen Prozesses, und hat ausschliesslich zum Ziel, die sich in der Höhle ansammelnden Eitermengen nach aussen abzuleiten, und eventuell eine Behandlung der Höhlenwand selbst zu ermöglichen. Das Vorgehen lehnt sich eng an dasjenige an, welches von Quincke und Garré, Körte, Lenhartz für die chronischen Lungenabscesse ausgearbeitet worden ist. Genau wie dort, wird nach Verlötung der Lunge mit der Brustwand durch Eröffnung der Cavernen mit dem Thermocauter ein Kanal geschaffen, durch den der Caverneninhalt nach aussen abfliessen kann. Garré präzisiert die Behandlung chronischer Lungenabscesse dahin, dass dieselben wie andere starrwandige Eiterhöhlen zu behandeln sind. "Das Lungengewebe wird ausführlich gespalten, die Wand der Caverne möglichst abgetragen, Pleuraschwarten im breiten Umkreis reseziert, und, wenn nötig, auch eine Nachresektion der Rippen

hinzugefügt. Man reseziere lieber eine Rippe zu viel als zu wenig." Auch bei tuberkulösen Cavernen wird man durch Pneumotomie die Höhle eröffnen und drainieren, dagegen auf alle Eingriffe, die eine vollständige Beseitigung der Caverne erzielen, verzichten. Es dürfte sich empfehlen, diese Eröffnung prinzipiell zweiseitig zu machen, und zwar in der Form, wie es neuerdings Perthes besonders empfohlen hat. Der erste Akt, die Rippenresektion und die eventuelle Naht der Pleurablätter, erfolgt am besten in Narkose bei leerem Zustand des Abscesses. Der zweite Akt, der mehrere Tage darauf folgt, soll ohne Narkose vorgenommen werden. Er besteht in der Probepunktion des Abscesses von der Wunde aus und in seiner Eröffnung.

Schon die chronischen Lungenabscesse haben im Vergleich zu den Erfolgen bei den akuten eine sehr schlechte Prognose. Aber noch ungünstigere Resultate hat die Eröffnung tuberkulöser Cavernen. Das hängt einmal von dem schlechten Allgemeinzustand der Phthisiker ab. Hinzu kommt als ein Haupthindernis für die Ausheilung, dass es sich meist nicht um eine einzige isolierte, sondern um multiple, oft nicht einmal miteinander in Verbindung stehende, Höhlen in der Lunge handelt. Schliesslich ist die Höhlenwand selbst und das umgebende Lungengewebe von tuberkulöser Infiltration durchsetzt und bietet so einen Zustand, dem alle Fähigkeiten zur Ausheilung fehlen. Damit wird auch die operative Behandlung der Höhlenwand, wie sie Garré mit dem Messer, und Körte mit dem Paquelin, bei chronischen Lungenabscessen mit Erfolg anwandten, unmöglich. Es bleibt nach der Operation immer eine stark secernierende Lungenfistel bestehn, es kommt zu Mischinfektionen, und die chronische Eiterung aus der Fistel bringt die Patienten schneller herunter, als der tuberkulöse Prozess selbst es tat.

Anders steht es bei denjenigen Fällen, bei denen durch Stagnation des Höhlensekretes und jauchigen Zerfall eine Resorption putrider Stoffe mit hohem Fieber und Intoxikationserscheinungen zustande kommt. Hier kann man von der Eröffnung der Caverne eine schnellere Entleerung der Höhle und Verhinderung der gefährlichen Aufnahme der Giftstoffe in den Organismus erhoffen; aber selbst dieser Vorteil wird von einem so erfahrenen Kliniker wie Quincke gering geschätzt, weil die Entleerung solcher Höhlen eher durch den Bronchialbaum, als durch die Fistel geschieht. Auf Grund chirurgischer Erfahrungen muss allerdings der Pneumotomie bei solchen Zuständen eine unmittelbare, günstige Wirkung zugesprochen werden, an die sich später leider wieder die Schattenseiten der chronischen Lungenfistel anschliessen. Auch die Pneumotomie bei gefährlicher Lungenblutung aus tuberkulösen Cavernen (Körte) wird nur aus der Indikation gemacht, einem dringlichen, besonders gefährlichen Zustande durch die Operation abzuhelfen. Ein Einfluss auf den tuberkulösen Prozess kommt weder hier noch dort in Frage.

Die Erfolge der chirurgischen Behandlungen der Lungencavernen durch

Pneumotomie sind in der Tat schlecht. Bei einer Statistik von Tuffier starben von 26–50 %, und von denen, die die Operation überstanden, sind nur einige wenige, welchen der Eingriff Nutzen gebracht hat. Ja man konnte im Jahre 1897 nur über eine einzige, durch die Operation herbeigeführte tatsächliche Heilung an der Lungencaverne verfügen. Das ist der Fall von Sonnenburg, den ich schon oben erwähnte.

Auch weitere Fälle von Franke, Salomoni, Malbet, Sarfert, Landerer und anderen sind ohne den gewünschten Erfolg operiert worden. Nur ein einziger lebte länger als zwei Jahre, die anderen gingen an ihrer Tuberkulose zu Grunde (Karewsky).

Diese Resultate reden eindringlich gegen die Berechtigung der Pneumotomie, zumal wenn man bedenkt, dass Besserungen, über die Operateure in einzelnen Fällen berichten, auch ohne Operation häufig zur Beobachtung kommen. Patienten mit grossen Cavernen können jahrelang leben, und bei ausreichender Expectoration, sogar unter relativem Wohlbefinden ihrem Berufe nachgehen.

Allerdings scheint bei einer besonderen Form der Cavernenbildung der Lunge die Operation günstigere Resultate zu erzielen; das sind die Fälle in denen der tuberkulöse Zerfall der Lunge die Peripherie derselben erreicht, und nach fester Verklebung beider Pleurablätter auch auf die Brustwand selbst übergreift.

Übereinstimmend werden hier von mehreren Chirurgen (Tuffier, Naentjen, und Karewsky) Heilungen berichtet. Karewsky empfiehlt, die Brustwand in grosser Ausdehnung fortzunehmen, und die tuberkulösen Massen durch Auskratzung mit dem scharfen Löffel zu beseitigen.

Diese günstigen Fälle sind aber sehr selten.

Die ungünstigen Erfolge der Pneumotomie bei tuberkulösen Lungencavernen werden von den meisten Chirurgen und Internen anerkannt. Sie erklären den gegenwärtigen ablehnenden Standpunkt gegen diese Operation. Dieser Eingriff hat, wie gesagt, nur bei ganz bestimmten Formen (isolierte Caverne mit Resorptionserscheinungen) infolge ungünstiger Abflussverhältnisse, oder bei kleinen peripher gelegenen Höhlen mit Übergreifen auf die Brustwand seine Berechtigung. Schon Quincke hat die Pneumotomie bei tuberkulösen Cavernen im Grossen und Ganzen verworfen, und als erster eine andere chirurgische Behandlung vorgeschlagen, "die Mobilisation der Brustwand durch ausgedehnte Rippenresektion." Sein Vorschlag stützt sich auf der Tatsache, dass der Ausheilung aller Lungenhöhlen, besonders aber der tuberkulösen Cavernen, die meist im oberen Thoraxabschnitt sitzen, als Haupthindernis die Starre des umgebenden Knochenringes im Wege steht. Durch ausgedehnte Rippenresektion hofft er einen Collaps der Höhle mit Retraction des Lungengewebes und Narbenbildung zu ermöglichen, und auf diese Weise eine Spontanheilung anzubahnen. Er empfiehlt diese Opera-

tion nur für die fibröse Form der Phthise, betont aber ausdrücklich, dass sie hier auch in den Fällen berechtigt ist, bei denen Cavernen nicht bestehen. Vorschlag Quinckes hat in aller jüngster Zeit wieder eine besondere Bedeutung erlangt. Darauf komme ich noch zurück.

Viel ernstere Beachtung, als alle bisher besprochenen Methoden operativer Behandlung der Lungentuberkulose verdienen Vorschläge, die in aller jüngster Zeit gemacht worden sind. Sie stützen sich an ältere Ideen und Versuche, aber durch die besondere Art ihrer Ausführung werden sie vielleicht den Weg zeigen wie wir der Tuberkulose der Lunge operativ beikommen können. Es ist die Freund'sche Operation der Tuberkulose der Lungenspitze und die Behandlung der vornehmlich einseitigen tuberkulösen Erkrankungen mit oder ohne Höhlenbildungen durch Lungencollaps.

Die Operation bei der Tuberkulose der Spitze stützt sich im wesentlichen auf Arbeiten, die bereits vor einem halben Jahrhundert Alexander Freund veröffentlichte. Freund machte damals den Vorschlag, durch Durchtrennung des ersten Rippenknorpels eine Besserung oder Heilung bei Spitzentuberkulose herbeizuführen. Dieser Vorschlag war die Folge seiner Untersuchungen über die Verengerungen der oberen Brustapertur und ihres Einflusses auf die Entwickelung der Tuberkulose. Es stellte sich heraus, dass in sehr vielen Fällen eine Verkürzung der ersten Rippenknorpel bezw. der ersten Rippe selbst beobachtet wird, und dass infolge dieser Verkürzung bei der, durch die beiden ersten Rippen gelegten Ebene eine verstärkte Neigung gegen die Horizontale eintreten kann. Diese Entwickelungshemmung wird meist erst im Pubertätsalter von Bedeutung, und zwar dadurch, dass die Lungenspitze infolge des verengten Raumes durch die erste Rippe komprimiert wird und die zuführenden Bronchien verengt werden. Als weitere, interessante Tatsache konnte dann Freund nachweisen, dass derartige Rippen auch viel früher verknöchern, damit ihre Elastizität verlieren, und als unbewegliche Spangen sich an der Lüftung des Thorax nicht mehr beteiligen. Eine wertvolle Ergänzung zu diesen Freund'schen Beobachtungen lieferte dann Hart in seiner Monographie über "die mechanische Disposition der Lungenspitzen zur tuberkulösen Phthise." Auch er konnte zunächst die Beobachtungen Freunds bestätigen, dass die, durch eine in der Kindheit durchgemachte Entwickelungshemmung verkürzten Rippenknorpel die normale quer-ovale Kartenherzform der oberen Brustöffnung in eine engere, grad-ovale Form umwandeln. Ferner stellte er fest, dass diese Rippen eine grosse Neigung zur Verknöcherung haben. Ausserdem aber fand er, dass dieselbe vorzeitige Verknöcherung, und zwar ohne Veränderung der Form der Öffnung, auch bei der Lungenspitzentuberkulose auftritt. In diesen Fällen hat der obere Rippenring nur seine Beweglichkeit und seine Beteiligung an der Thoraxbewegung verloren. Weiter liess sich feststellen, dass bei ausgeheilter Lungenspitzentuberkulose, sich öfters an dem ver-

knöcherten Rippenknorpel, an der Knorpelknochengrenze, ein neugebildetes Gelenk findet. Diese gewiss sehr wichtigen, anatomischen Befunde lassen sich in Einklang bringen mit anderen bemerkenswerten Beobachtungen der pathologischen Anatomen. So zeigte Birch-Hirschfeld, dass die Lungentuberkulose meist in den Bronchien 3. bis 5. Ordnung des Oberlappens beginnt, und besonders häufig in dem spitzen Ast, den er als Bronchus apicis posterior bezeichnet. Er nahm an, dass die steile Verlaufsrichtung dieser Bronchien es mit sich bringt, dass der Luftstrom bei der Atmung, dem in der Luftröhre entgegengesetzt ist, und glaubt, dass dadurch leichter infectiöses Material bei der Atmung dort sich ansammeln kann. Wichtiger ist, dass er durch Ausgüsse des Bronchialbaums sehr häufig Kompression und Formveränderungen an diesen Bronchialästen nachweisen konnte, die seiner Ansicht nach ein Beweis dafür seien, dass raumbeengende Momente auf dieselben gedrückt haben. Die beste Unterlage für diese Vorstellung der mechanischen Kompression der Lunge durch die erste Rippe lieferte dann Schmerl. Dieser Autor beschrieb nämlich eine, an Lungen Erwachsener vorkommende, "die Lungenspitze von hinten und oben nach vorn und unten zu umgreifende Furche. Diese Furche ist in einzelnen Fällen verschieden stark entwickelt; bald erscheint sie als flache Rinne, die oben nur angedeutet ist, bald als 1 cm. breite, scharf von der Umgebung abgesetzte, bis fingerdicke Einsenkung, durch welche eine Abschnürung der Lungenspitze von den übrigen Lungenabschnitten des Lungengewebes am stärksten entwickelt und am tiefsten. Sie liegt 1 bis 2 cm. unterhalb der höchsten Erhebung der Lungenspitze, also gerade in dem Verbreitungsbezirke derjenigen Bronchialäste, welche nach Birch-Hirschfeld einerseits am häufigsten Irregularitäten ihres Verlaufs und ihrer Anordnung erkennen lassen; andererseits aber die Predilektionsstelle für die beginnende Tuberkulose bilden." Auch Schmerl erklärt diese Furchenbildung durch mangelhafte Entwickelung der ersten Rippe, Verengerung der Brustapertur und Druck auf die Lungenspitze.

Umsomehr erscheint diese Überlegung berechtigt, als, wie gesagt, in vielen Fällen ausgeheilter Spitzentuberkulose, Gelenkbildung an der Knorpelknochengrenze der verkürzten Rippe gefunden wird. Hart stellte sogar in 400 Leichen Erwachsener, in 97 Fällen, Gelenkbildung an dem ersten Rippenknorpel fest. In den 45 Fällen einseitiger Gelenkbildung fand sich 30 mal ganz, oder nahezu ganz, abgeheilte Tuberkulose; 9 mal waren die Spitzen gesund, 6 mal lag proretente Phthise vor; unter 52 Fällen doppelseitiger Gelenkbildung fand sich 33 mal ausgeheilte oder in Heilung begriffene Tuberkulose; 2 mal progrediente Phthise, 8 mal waren die Lungenspitzen gesund. Unter 97 Fällen von Gelenkbildung fand sich also 63 mal Ausheilung eines tuberkulösen Spitzenprozesses; 17 mal zeigten die Lungen keine Spuren vorhergegangener Erkrankung, und 17 mal lag progrediente Phthise vor.

Der erste, der auf Grund dieser zwingenden Überlegungen in einem geeigneten Falle von Spitzentuberkulose die Mobilisation der ersten Rippe vornahm, war Kausch. Am 6 2 1907 resezierte er bei einer 53jährigen Frau 1–15 cm. der ersten rechten Rippe an der Knorpelknochengrenze. Bei der Operation fand er den Knorpel verdickt und stark verknöchert. Noch während der Operation konnte er beobachten, wie die erste Rippe langsam begann, sich an der Atmung zu beteiligen. Der Verlauf war glatt, nur traten bald nach der Operation reissende Schmerzen im rechten Arm auf, die auf eine Reizung des Rippenstumpfes auf den plexus brachialis zu beziehen sind. Wichtig ist, dass bereits nach 3 Wochen der Lungenbefund sich wesentlich gebessert hatte.

Bald darauf operierte dann Seidel 2 weitere Fälle. In dem ersten Falle handelte es sich um einen 21jährigen Mann mit linksseitigem, ausgesprochenem Spitzenkatarrh und typisch paralytischem Thorax. Seidel resezierte 2 cm. des Knorpels der 1. Rippe. Auch bei diesem Patienten traten in der ersten Zeit ziehende Schmerzen im linken Arme auf, die dann aber von selbst verschwanden. Der Patient wurde nach der Operation einer Lungenheilstätte überwiesen und als geheilt entlassen.

In dem zweiten Falle wurde ein 20jähriger Pfleger wegen rechtsseitiger Spitzentuberkulose in derselben Weise operiert. Auch Seidel konnte hier beobachten, dass noch während der Operation die erste Rippe die Atmung wieder aufnehmen.

Die Beurteilung über den Wert dieser neuen Behandlungsmethode der Spitzentuberkulose ist schwierig. Die Beobachtungszeit nach der Operation ist noch zu kurz, und die Zahl der Fälle zu gering. Der unmittelbare Erfolg aller Fälle und die Einfachheit der Ausführung der Operation ermutigen zu weiteren Versuchen auf diesem Wege, und es wäre zu hoffen, dass diese auf exacter pathologisch-anatomischer Beobachtung die Gründe der Therapie behanptete.

Aber ähnlich, wie bei der Resektion der Lungenspitze ist hier die Frage berechtigt, ob die Operation notwendig ist. Die vielen Spontanheilungen der beginnenden, frühzeitig behandelten Spitzentuberkulosen lassen es auch hier zweifelhaft erscheinen. Allerdings hat die Freund'sche Operation gegenüber der Spitzenresektion den grossen Vorteil der relativen Gefahrlosigkeit und Einfachheit der Ausführung. Deshalb könnte man eher geneigt sein, in geeigneten Fällen Versuche mit ihr zu machen. Man müsste sie dann ansehen als ein Unterstützungsmittel bei der Therapie der Lungentuberkulose. Mehr wird nicht zu erwarten sein. Denn die Operation erreicht keine Beseitigung des tuberkulösen Herdes, der die Resektion der Spitze anstrebt, sondern sie schafft nur günstigere Verhältnisse für den Heilungsprozess. Daraus folgt also, dass wir, trotz der Mobilisation der ersten Rippe immer nach wie vor, die Allgemeinbehandlung einleiten müssen.

Auch ist noch nicht sicher erwiesen, dass der tuberkulöse Prozess in der arbeitenden, sich bewegenden Spitze besser ausheilt als in der ruhenden. Unsern Erfahrungen bei der Tuberkulose anderer Organe widerspricht er. Das tuberkulöse Kniegelenk heilt, wenn es ruhig gestellt wird, und die tuberkulöse Hüfte wird in Streck- und Gipsverbände gelegt, damit jede Bewegung und Funktion ausgeschaltet wird. Auch an der Lunge selbst scheint die absolute Ruhigstellung doch von Bedeutung zu sein, wie uns die Erfahrungen mit der Pneumothoraxbehandlung lehren. Auf der anderen Seite können wir dagegen annehmen, dass gerade die bessere Durchflutung der Spitze mit Blut für die Ausheilung eines tuberkulösen Prozesses günstiger wäre. Die Richtigkeit dieser Auffassung zugegeben, muss man anerkennen, dass wir eine Hebung der Cirkulation auch auf anderem Wege, durch Atmungsgymnastik und durch Atmung im pneumatischen Kabinett, einfacher erreichen können. Besondere Erwähnung verdient die Anwendung der Kuhn'schen Lungensaugmaske. Ihre Wirkung besteht darin, dass die Inspiration beträchtlich erschwert wird, und auf diese Weise eine Dehnung der Lungenalveolen erzielt wird. Gleichzeitig entsteht dadurch die Hyperämie der Alveolargefässe. Es liegen bereits eine ganze Reihe günstiger Berichte vor, die zu weiteren Versuchen mit dieser Methode durchaus ermutigen. Auch anatomische und physiologische Bedenken gegen die Freund'sche Lehre fehlen nicht. So liesse sich bei der grossen Abhängigkeit des Skelettes von den Weichteilen die Freund'sche Verknöcherung der ersten Rippe in einzelnen Fällen (natürlich nicht da, wo dieselbe bereits in der Jugend auftrat) sehr wohl als eine Folge, und nicht als die Ursache, einer mangelhaften Tätigkeit des oberen Thoraxabschnittes ansehen.

Auch die Bedeutung der Schmerl'schen Lungenfurche darf nicht überschätzt werden, denn eine andere Eindällung der Spitze wird fast bei allen Menschen auf der Vorderseite beobachtet. Es ist die, die nach Pansch durch den Druck der Subclavia entstanden ist. Beachtenswert sind schliesslich auch die Einwände, die Hofbauer gegen die Freund'sche Theorie anführt. Er glaubt auf Grund exacter physiologischer Messungen, dass die Excursionsfähigkeit des oberen Thoraxabschnittes genügend ist, und dass eine regelmässig durchgeführte Atmungsgymnastik eine Besserung der Spitzenatmung herbeiführen kann ohne Operation. Auf Einzelheiten dieser interessanten Arbeit kann nicht näher eingegangen werden. Immerhin scheint aber die Freund'sche Operation für einzelne ausgesuchte Fälle, bei denen eine wirkliche, funktionell nachweisbare Starrheit der ersten Rippe besteht, durchaus angezeigt, und weitere Arbeit auf diesem Wege ist nicht aussichtslos.

Ein endgültiges Urteil über den Wert der operativen Mobilisation der Spitze lässt sich heute noch nicht fällen. Schon Kausch betont, "dass nur zahlreiche Fälle, lange Beobachtungsdauer, und strenge Kritik zu einem definitiven Urteil führen können."

Die neueste Wendung in der Chirurgie der Lungentuberkulose wird dargestellt durch die Versuche, einseitige Phthisen durch künstlichen Lungencollaps zu behandeln. Derselbe wird erreicht entweder durch Anlegen eines künstlichen Pneumothorax, oder durch Mobilisation der ganzen Brustwand durch totale "Entknochung" derselben.

Forlanini war der erste, der den Pneumothorax bei der Behandlung der Lungentuberkulose empfahl. Unabhängig von ihm kam Murphy auf dieselbe Idee. Neuerdings hat Brauer dieses Verfahren ganz besonders ausgearbeitet. Es besteht darin, dass den Patienten durch Einblasen eines bestimmten Quantums Stickstoff (durchschnittlich 500–1000 cm.) ein künstlicher Pneumothorax angelegt, und auf diese Weise die Lunge zum Collaps gebracht wird. Die durch die Lungenkompression hervorgerufene funktionelle Ausschaltung der Lunge, ihre Ruhigstellung, ferner die Veränderungen in der Blut- und Lymphcirculation, sollen die Bindegewebswucherungen begünstigen, und dadurch eine Heilung der Tuberkulose ermöglichen. Die ursprüngliche Technik dieses Verfahrens war so, dass in der üblichen Weise die Pleurahöhle punktiert wurde, und durch die Punktionskanäle unter Controlle der Menge und des Druckes Stickstoff eingelassen wurde. Stickstoff wurde genommen, weil er schlechter als andere Gase resorbiert wird, und der Pneumothorax damit längere Zeit besteht. Murphy und Brauer haben diese Technik abgeändert. Speciell Brauer ist der Ansicht, dass in dem infiltrierten Lungengewebe die dünnwandigen Lungenvenen der Punktionsnadel nicht, wie im gesunden Gewebe, ausweichen können, und ihre Verletzung gelegentlich zu tötlicher Luftembolie führt. Auch kann bei einer solchen Punktion sehr leicht ein grösserer, tuberkulöser Herd der Lunge getroffen werden, dessen Eröffnung dann sekundär zu einer Infektion der Pleurahöhle führt. Vor allen Dingen aber ist es bei der einfachen Punktion unmöglich, sich von der Beschaffenheit der Pleurablätter zu überzeugen. Voraussetzung für das Gelingen eines Pneumothorax ist nämlich das Fehlen ausgedehnter Pleuraverwachsungen. Brauer hat aus diesem Grunde der Punktion der Pleurahöhle eine Incision in einem Intercostalraum vorausgeschickt. Er durchtrennt mit einem 5 cm. langen Schnitt die Muskulatur bis auf die Pleura. Jetzt wird mit einem stumpfen Troikar die Pleurahöhle eröffnet. Es dringt Luft neben dem Instrument in dieselbe ein, die Lunge collabiert, weicht der Punktionsnadel aus, und wird auf diese Weise nicht verletzt. Erst jetzt wird in derselben Weise wie bei der einfachen Punktion ein bestimmtes Quantum Stickstoff in die Pleurahöhle eingelassen, und dann die Weichteilwunde durch einige Nähte wieder geschlossen. Es ist dabei Wert auf eine exakte Muskelnaht zu legen, um das Zustandekommen eines Hautemphysems zu vermeiden. Ein derartiger Schnitt bedeutet keine Komplication der Operation, verhindert aber Gefahren und lässt von vornherein erkennen, ob überhaupt die Pneumothoraxtherapie

durchführbar ist, oder nicht. Sowohl bei der Punktion als auch bei der Schnittmethode muss der zuerst angelegte Pneumothorax in bestimmten Zeitintervallen erneuert werden. Diese sogenannte Nachfüllung des Pneumothorax kann nun in der gewöhnlichen Weise, durch einfache Punktion vorgenommen werden. Unter Controlle des Röntgenschirms und unter Beobachtungen des Manometers wird die Pneumothoraxblase eingestellt, und jetzt die Nadel in den Hohlraum eingestochen. Die Operation ist, wie ich mich selbst überzeugen konnte, einfach, und wenn keine Pleuraverwachsungen da sind, zuverlässig. Es lassen sich in einer Sitzung 500, 800, ja 1000 cm. Stickstoff einfüllen, ohne dass Störungen der Atmung oder der Herztätigkeit eintreten. Die Punktion selbst kann mit lokaler Anästhesie vorgenommen werden.

Brauer berichtet über 60 Patienten, bei denen er diese Pneumothoraxtherapie angewendet hat. In 45 von diesen Fällen, also in 75%, fand sich freier Pleuraraum, so dass die Anlegung des Pneumothorax gelang. Auf Grund dieses Materials berichtet Brauer über Indication und Erfolg dieser Behandlungsmethode. Das Verfahren ist angezeigt bei allen, in der Hauptsache einseitigen Phthisen, mit und ohne Höhlenbildung, die bisher den allgemeinen Behandlungsmethoden getrotzt hatten. Voraussetzung ist aber, dass keine Verwachsungen der Pleurahöhle bestehen, denn diese verhindern das Zustandekommen eines künstlichen Pneumothorax, und sind für diese Therapie vollständig ungeeignet. Bei diesen Patienten kann die Retraction der Lunge für narbige Schrumpfung nur durch Mobilisation der Brustwand, d. h. Abtragung aller Rippen erzielt werden.

Die sicherste und häufigste Wirkung des Pneumothorax zeigt sich in dem Abfall des Fiebers. Das Fieber verschwindet in solchen Fällen verschieden rasch, bleibt dann entweder dauernd fort, oder tritt nur gelegentlich wieder in der Form sporadischer Temperatursteigerung auf. Auch das Körpergewicht pflegt bei gesunden Verdauungsorganen bald zu steigen, die Sputummenge nimmt ab, es sinken bezw. verschwinden die elastischen Fasern und Tuberkelbazillen, und mehrfach blieb das Sputum überhaupt ganz aus. Auch konnte Brauer mehrfach beobachten, dass nach Einleitung der Pneumothoraxbehandlung erregte Herzaktion, mässige Cyanose und dyspnoische Atmung verschwanden. Schliesslich erwähnt Brauer als weiteren Erfolg die gute Rückwirkung auf das subjektive Befinden. Die Leute fühlen sich wohler und werden leistungsfähiger. Gelegentlich beobachtete Brauer im weiteren Verlauf seröse Exudationen in die Pleurahöhle, die im allgemeinen ohne weitere Bedeutung für die Patienten waren. Sie sind wohl als Folgen der Reizung durch die starke Stickstoff-Füllung anzusehen.

Weit wichtiger als die klinischen Beobachtungen scheinen mir die pathologisch-anatomischen Unterlagen zu sein, die Brauer für die Pneumothoraxtherapie beibringen kann. Von 7 Fällen, die im Laufe der Behandlung

starben, wurden 3 seziert. Es fanden sich in der Collapslunge nur vereinzelt frische Tuberkel, in den Tuberkeln auffallend trockene Verkäsungen. Ausserdem wenig acute Zerfallserscheinungen; dagegen sehr ausgeprägte, reactive Bindegewebsvermehrung und vorgeschrittene Narbenbildung. Diese Befunde sind zum mindesten ein Beweis dafür, dass die pathologisch-anatomischen Voraussetzungen des Verfahrens richtige sein können. Die Tuberkulose heilt erfahrungsgemäss durch Bindegewebswucherungen aus, der künstliche Pneumothorax regt eine derartige Bindegewebswucherung an, folglich ist der Pneumothoraxtherapie eine Heilwirkung bei der Tuberkulose zuzusprechen. Ein Hauptvorteil des Verfahrens liegt meines Erachtens darin, dass es mit einfachen Mitteln, ohne eingreifende Operation erzielt werden kann. Die Gefahr der Lungenverletzung lässt sich durch das Brauer'sche Vorgehen vermeiden, wohl das einzige Bedenken, das man gegen das Verfahren haben kann. Unangenehm für den Patienten ist nur das häufige Nachfüllen.

Nach Brauers Indicationsstellung kommt die Pneumothoraxbehandlung nur bei fortgeschritteneren Fällen zur Anwendung. Sie hat zur unbedingten Voraussetzung eine freie Pleurahöhle, in der sich ein Pneumothorax zuverlässig anlegen lässt. Die Erfolge Brauers und Forlaninis sprechen dafür, dass das Verfahren mehr als bisher angewendet werden sollte.

Die zweite Form der Behandlung chronischer Phthisen durch Lungencollaps und Kompression, oder durch "Volumeneinengung" der Lunge, ist eine Erweiterung der von Quincke und Spengler angeregten, und von Spengler, Bier, Landerer, Turban, und v. Mikulicz bereits ausgeführten Mobilisation der Brustwand. Diese Operation sollte zuerst nur dem Zwecke dienen, umschriebene Brustwandpartien über Cavernen im Lungengewebe durch Rippenresektion nachgiebig zu machen, und dadurch die Höhle zum Collaps zu bringen. Aber Quincke hat seine Idee der künstlichen Narbenschrumpfung der Lunge auch schon ausgedehnt auf Fälle ohne Cavernenbildung, bei denen es sich um eine universelle, einseitige Phthise handelte.

Während die früheren Operateure aber die Rippen nur in einer Ausdehnung von 30–50 cm. wegnahmen, entfernt Friedrich, der diese Mobilisation der Brustwand neuerdings in besonderer Weise vornimmt, im Durchschnitt ungefähr 200 cm.

Zunächst wurde diese erweiterte Methode angewandt bei 4 Patienten, bei denen Brauer die Anlegung des künstlichen Pneumothorax wegen Verwachsungen der Pleurablätter nicht gelungen war. Für derartige Fälle hatte Brauer bereits in seiner ausführlichen Pneumothoraxarbeit im Universitätsprogramm 1906 die Quincke-Spengler'sche Operation in Aussicht genommen. Im Einverständnis mit Brauer hat dann Friedrich diese Mobilisation der Brustwand durch ausgedehnte Rippenresektion vorgenommen. Die technische Ausführung dieser Operation wurde von Fried-

rich aber so erweitert und geändert, dass dieselbe in der jetzigen Form als "Entknochung des Thorax" ganz erheblich von dem ursprünglichen Vorgehen Quincke-Spengler's abweicht. Friedrich begnügt sich nicht mehr mit der Resektion einiger Rippen, sondern nimmt in grosser Ausdehnung vom Sternalrand bis zum Angulus costæ die 2.–10. Rippe, mit peinlichster Schonung der Pleura fort. Die Weichteilschnittführung bei dieser Operation ist dieselbe, wie bei der Scheede'schen Thorakoplastik: nach Bildung eines Hautmuskellappens dergestalt, dass die letzten Zacken des Musculus serratus stehen bleiben, während der ganze übrige Muskel mit seinen Nerven und Gefässen im raschen Zuge nach oben geklappt wird, unter gleichzeitiger rechtwinkliger Abhebelung des Schulterblattes vom Thorax. Hierdurch wird innerhalb weniger Minuten die freieste Übersicht über die 2.–10. Rippe gewonnen. Der 2. Akt besteht dann in der Wegnahme der Rippen unter sorgfältiger Schonung der Pleura. Dies gelingt dort, wo sie durch alte Entzündung oder Verwachsung mit der Lunge verdickt ist, leicht; allerdings muss hervorgehoben werden, dass die Stärke der Pleura selbst bei demselben Kranken an verschiedenen Stellen wechseln kann; sodass immer grösste Vorsicht bei der Auslösung der Rippen geboten ist. Wo Verwachsungen fehlen, kann selbst dem Geübtesten gelegentlich ein Einriss des Brustfells vorkommen. An sich hat diese Complication immerhin nicht die Bedeutung, wie einige, so zum Beispiel Turban, annehmen, zumal dann, wenn die augenblicklichen Gefahren des Pneumothorax durch Tamponade, oder besser durch Anwendung von Druckdifferenz vermieden werden, und wenn der Schluss der Pleurawunde sofort so gelingt, dass eine sekundäre Infection der Brusthöhle verhindert wird.

Friedrich hat im ganzen 7 Fälle in dieser Weise operiert. Es handelte sich immer um in der Hauptsache einseitige Phthisen, bei denen die bisherige Behandlung keine, oder nur geringe, Besserung erzielt hatte. Von diesen 7 Patienten starben 2 kurze Zeit nach der Operation; 2 von den Überlebenden zeigten eine ausgezeichnete Besserung des localen und Allgemeinzustandes, und konnten ohne Fieber, mit nur geringem Auswurf die Klinik verlassen. Bei den übrigen Patienten war die Besserung nicht so eclatant, aber immerhin doch deutlich nachweisbar.

Auch über diese Behandlungsmethode kann ein endgültiges Urteil noch nicht gefällt werden. Die Zahl der Fälle ist zu klein, und die Zeit nach der Operation noch zu kurz.

Soviel lässt sich heute aber schon sicher sagen, Fieber und Auswurf werden auch durch die Operation sehr günstig beeinflusst, und die dadurch erzielte Besserung des Allgemeinbefindens kann in nicht zu weit vorgeschrittenen Fällen eine ganz ausserordentliche sein. Die Operation ist technisch einfach, und wir wissen aus der Erfahrung bei der Thorakoplastik alter Empyeme, der diese Operation ja sehr ähnelt, wie gut der grosse Ein-

griff, trotz Narcose und Blutverlust, im Allgemeinen vertragen wird. So nahm Scheede bei veralteten Empyemen alle Rippen von der 1. bis zur 10., vom Rippenknorpel bis zum Angulus costæ fort, und die vielen Arbeiten, die die Zweckmässigkeit der Scheede'schen Operation zum Inhalt haben, berichten über ihre relative Gefahrlosigkeit, trotzdem sie sogar sehr oft bei tuberkulösen Individuen ausgeführt wird. Bardenheuer hat sogar ausser den Rippen noch die Scapula mitentfernt. Auch Friedrich's Patienten zeigen, dass dieser Eingriff im Grossen und Ganzen, trotz seiner Grösse sehr gut vertragen wird, jedenfalls von Leuten, deren allgemeiner Kräftezustand noch nicht zu reduciert ist.

Aber eine Gefahr hat diese Operation gegenüber der Scheede'schen. Sie ergibt sich aus der Art des Eingriffes. Nach Entfernung der knöchernen Thoraxwand drückt der äussere Luftdruck auf den Weichteillappen, und da dieser der Lungenoberfläche aufliegt, auch natürlich auf Lungenwurzel, Mediastinum, und vor allen Dingen auf das Herz. Die Folge davon ist, dass dieses ähnlich so verdrängt wird, wie es beim offenen Pneumothorax geschieht. Wir wissen, dass dieses Verdrängen des Mediastinums und des Herzens mit seinen Gefässen, Hauptgrund abgibt für die Entstehung der Pneumothoraxfolgen (Garré). Die Verlagerung des Herzens, die Compression der Lunge der andern Seite, das sind Gefahren, die sich unmittelbar an die Operation anschliessen und einige Tage fortbestehen können, bis eine Anpassung an die neuen Verhältnisse eingetreten ist. Auch im Tierexperiment kann man beobachten, welche Bedeutung die unmittelbare Wirkung des Atmosphärendruckes auf das Herz hat. Wenn man auf einer Thoraxseite die Rippen entfernt und luftdicht den Weichteillappen auf die unversehrte Lunge legt, so tritt, solange die Tiere unter Druckdifferenz bleiben, keine Dyspnoë ein. Im Augenblick aber, wo der äussere Luftdruck die entknöcherte Brustwand eindrückt und Lunge und Mediastinum belastet, tritt Atemnot bei den Tieren auf. Um so bemerkenswerter ist diese Tatsache, als die Entfernung selbst einer ganzen Lunge eine Atmungsinsufficienz nicht hervorruft. Dass bei der Scheede'schen Operation diese Complication keine Rolle spielt, hat zwie Gründe. Erstens besteht ja bei den betreffenden Patienten seit langer Zeit ein Pneumothorax, durch den allmählich diese Verdrängung des Mediastinums und die Compression der andern Lunge schon eingeleitet war, und nicht plötzlich eintritt. Zweitens kann das narbige, derbe Mediastinum bei einem chronischen Empyem nicht mit dem normalen Mittelfell verglichen werden; ersteres ist eine feste, unnachgiebige Scheidewand, letzteres eine dünne, nachgiebige, flatternde Haut.

Im Einklange mit diesen Tatsachen steht, dass nach den ausgedehnten Rippenresektionen oft eine vorübergehende, kritische Herzschwäche eintritt. Es wird in einigen Fällen das Pendeln des Herzens und die ihm zugemutete Mehrarbeit zu einer ernsteren Schädigung führen können, und dadurch

Gefahr bringen. Sorgfältige Controlle des Herzens, Stärkung seines Muskels durch Digitalis vor, und Campher während und nach der Operation, können die Gefahren mindern. Auch scheint mir die Durchführung der Narcose, wie Friedrich sie anwendet, von Wichtigkeit zu sein. Er gibt 20 Minuten vor der Operation 1–1½ cgr. Morphium. Das Operationsgebiet wird durch Schleich'sche Infiltrationsanästhesie unempfindlich gemacht. Gleichzeitig wird eine ganz oberflächliche Cloroformtropfnarcose, bei der durchschnittlich nur 1–15 cm. Narcoticum gebraucht werden, eingeleitet.

Eine zweite Schattenseite der Operation liegt in der Entstellung des Thorax. Der Verlust einer ganzen Brustwand kann, namentlich im jugendlichen Alter, nicht gleichgültig sein. Ob es nach längerer Zeit zu Deformitäten der Wirbelsäule kommt, muss abgewartet werden. Ein Vergleich mit den Empyemen ist nicht zulässig. Bei diesen ist infolge des Narbenzuges der Pleura und des Aufeinanderrückens der Rippen stets die Wirbelsäule mit der Concavität nach der kranken Seite hin verkrümmt. Diese Skoliose, die mitunter beträchtliche Grade annehmen kann, schwindet nach der Operation gewöhnlich sehr bald, wenn ihre veranlassende Ursache mit der Entfernung von Pleura und Rippen beseitigt ist.

Für das Gelingen dieser Operation ist die Auswahl geeigneter Fälle die Hauptvorbedingung.

Man wird diese grossen Operationen nur Patienten zumuten, die sich in ausgezeichnetem Kräftezustand befinden.* Dabei ist von grosser Wichtigkeit, dass es sich wirklich in der Hauptsache um einseitige Phthisen handelt. Die Operation ist dann weiter ausgeschlossen bei krankem Herzen und gleichzeitig bestehender Darmtuberkulose. Schliesslich wird man sich überhaupt zu diesem grossen Eingriff nur dann entschliessen, wenn die übrigen Behandlungsmethoden versagt haben.

Ob durch Friedrich's Operationsmethode Dauererfolge zu erzielen sind, steht abzuwarten. Bei einer so eigenartigen Krankheit, wie die Tuberkulose, bei der vorübergehend auch spontane Besserungen eintreten können, ist die strengste Kritik die Voraussetzung für die richtige Beurteilung des Wertes einer Behandlungsmethode. Allerdings lässt der von Friedrich erzielte unmittelbare Erfolg ein Weiterarbeiten auf diesem Gebiete gerechtfertigt erscheinen.

Damit bin ich am Schluss meines Referates angelangt. Ich habe die von der Kongress-Leitung mir gestellte Aufgabe zu erledigen versucht, dadurch, dass ich eine Übersicht gab über das, was bisher auf dem Gebiete der Lungentuberkulose von der Chirurgie geleistet worden ist, und was wir überhaupt von ihr zu erwarten haben.

Die positiven Resultate operativer Behandlungen der Lungentuberkulose sind noch sehr klein. Aber es steht zu hoffen, dass mit dem wachsenden

* Die näheren Indikationen sind in den Friedrich' schen Arbeiten zu finden.

Intresse für die Thoraxchirurgie auch die modernsten Versuche, die Lungentuberkulose operativ zu beeinflussen, an Bedeutung gewinnen. Ich denke hier in erster Linie an die Freund'sche Operation, an die Pneumothoraxbehandlung und an die "Entknochung" der Brustwand. Für jeden weiteren Fortschritt ist unbedingt notwendig, dass innere Kliniker und Chirurgen Hand in Hand arbeiten; und die Ausarbeitung der präcisen Indicationen und die Erkenntnis, welche Operationsmethode die meiste Aussicht auf Erfolg hat, kann nur das Produkt gemeinsamer Arbeit sein.

SECTION III.

Surgery and Orthopedics (*Continued*).

THIRD DAY.

Wednesday, September 30, 1908.

TUBERCULOSIS OF THE BONES AND JOINTS.

The Section was called to order by the President, Dr. Charles H. Mayo, at half-past nine o'clock.

TUBERCULAR ARTHRITIS OF THE HIP-JOINT.

By Stephen H. Weeks, M.D.,
Portland, Maine.

The term hip-joint disease is very objectionable, but has been so long in use and is so generally accepted that it is difficult to get rid of it. Laennec was the first to teach that some joint diseases are tubercular, and he was soon followed by Virchow and Volkmann. Many at that time believed in the microbic origin of tuberculosis, but none could prove it until 1882, when Robert Koch discovered the tubercle bacillus. The time has long since passed when it is necessary to offer proof that the tubercle bacillus is the cause of tuberculosis; it is sufficient here to say that it is always found where tuberculosis exists, whether in the lungs, brain, abdomen, bones, or joints, and that artificial tuberculosis can be produced by injecting the bacilli into animals. The facts that the vast majority of chronic joint diseases are tubercular and that the bacillus is not peculiar to certain individuals have a practical bearing upon the diagnosis, prognosis, and treatment in these cases. It should be constantly borne in mind that joint tuberculosis is a local disease, and should be treated as such. It is the surgeon's duty to use every effort to prevent this local disease from becoming general. It is rarely that tubercular joint disease ends fatally, except when some other more vital part becomes secondarily affected. While we know that the

bacillus is the cause of tubercular joint disease, we also know that certain auxiliary conditions are necessary for the development of a local tuberculosis. The fact that tubercular inflammation is so frequent in children, and that it begins, as a rule, in some center of growth or development, would indicate that growing tissue offers the necessary requirements for its development. I believe that an injury, in the vast majority of cases, offers or produces the place of least resistance for the lodgment and development of the tubercle bacillus in joint disease, because I have seen so many cases in which the disease could be directly traced to an injury that I am satisfied that the same cause exists, frequently when overlooked. Just as a severe injury is liable to be followed by the ordinary phenomena of an acute inflammation, so is a slight injury to be followed by a tubercular inflammation. It is usually the active child of a family, who is most subject to falls and accidents, who develops a joint tuberculosis. The fact that some tubercular taint can be found in the family history proves nothing, for few families are free from such taint. Tuberculosis of the hip-joint is a chronic destructive disease that results in loss of function and deformity, if not detected in its early stage and treated in accordance with modern methods.

Pathology.

Tuberculous disease of the hip-joint usually begins in several minute foci in the neighborhood of the epiphyseal cartilage of the head of the femur. Here the circulation is most active, and here the newly formed bone is least resistant. Thus the bacilli, carried by the blood-stream, are more often deposited at this point, where, under favoring conditions, induced it may be by slight traumatism, the disease is established. The foci coalesce, and an area of infected granulations replaces the normal structures. If the local resistance is sufficient, the disease may be confined to the interior of the bone, but in most instances it gradually forces its way into the joint, and the granulation tissue, spreading under and over the cartilage, destroys it in its progress. The lining membrane of the joint becomes involved in the disease, and finally the adjoining surface of the acetabulum as well. In a certain number of cases the disease begins about the epiphyseal junctions in the acetabulum, and the primary disease may begin in the synovial membrane, although this is uncommon in children. From a clinical standpoint, primary disease of the acetabulum may be inferred when the patient is particularly susceptible to movements of the trunk, or when lateral pressure on the pelvis causes pain; or when a Roentgen picture shows greater erosion of the acetabulum than of the head of the femur. As a rule, however, the symptoms may be best explained by primary disease of the head of the thigh bone. The appearances in advanced cases, as seen at operation or autopsy, may be summarized somewhat as follows: The head of the femur is deeply eroded, its

cartilaginous covering has practically disappeared or is in part still adherent in necrotic shreds. It lies in seropurulent fluid, surrounded by the gelatinous necrotic granulations that line the capsule and partly fill the enlarged acetabulum. In certain instances the pelvic bones may be diseased, the acetabulum may be perforated, or the shaft of the femur may be involved.

Relative Frequency. Age. Sex. Side Affected.

Tuberculosis of the hip-joint is the most common and the most important of the affections of the joints, ranking second to Pott's disease of the spine. In a total of 7841 cases of tuberculous disease treated in the out-patient department of the Hospital for Ruptured and Crippled in New York city in the fifteen years from 1885 to 1899, 3203 were Pott's disease and 2230 were hip disease, while the remaining 2408 cases included all the other joints.

Hip-joint disease is essentially a disease of early childhood, although no age is exempt.

Sex exercises but little influence, although the disease is slightly more common among males than among females.

In disease of this as of other joints the right is somewhat more often affected than the left.

Etiology.

Three factors are recognized in the etiology of tuberculosis: the infectious element (the tubercle bacillus), the general predisposition of the patient, and the local condition that favors the reception and growth of the bacilli.

Predisposition.—The predisposition, both general and local, is spoken of as lessened vital resistance. A general predisposition to this disease may be inherited or it may be acquired. Thus a history of tuberculosis in the immediate family of the patient is supposed to imply a lessened resistance to this form of disease. In a certain proportion, perhaps 25 per cent., of the cases this inherited predisposition is very direct and positive, but in the larger number the family history is as indefinite as in a similar class of patients under treatment for any other form of ailment. The acquired predisposition is of more direct importance, since it would include the lowering of the vitality due to improper food and improper hygienic surroundings of every variety, together with the greater liability to depressing diseases and the more constant exposure to tuberculous infection that such conditions imply. Thus tuberculous disease of the bones and joints, as well as other parts, is more common among the poor of cities than among the more favored classes.

Mode of Infection.—The tubercle bacilli may be introduced into the system by inhalation, and find their way to the bronchial glands, or by the mouth, and set up disease in the mesenteric glands, or, after infection of the nasal passage or neighboring parts, secondary disease of the cervical lymphatics may appear in the so-called scrofulous glands of the neck.

Latent Tuberculosis.

It may be assumed that disease of the bronchial and mesenteric glands is not uncommon in persons of apparently perfect health, since it is often discovered at autopsies in those who have died from other causes. This form of glandular disease is called latent tuberculosis, and it usually precedes a local outbreak in the bone or elsewhere. In many instances the disease may remain latent and finally disappear, or it may persist, and from time to time free bacilli or bits of infected tissue may escape into the blood-current; by it they are deposited in other parts, where, under favoring conditions, local disease may be set up. Depression of the vitality from any cause may be supposed to favor the progress of the glandular disease, which may lead to a dissemination of the infectious elements, and at the same time it may lessen the resistance of other tissues that may be exposed to the infection. This accounts for the well-known influence of certain diseases, such as measles and whooping-cough, not only in predisposing to local tuberculosis, but in favoring its progress when it is already established. It, however, is possible that the bacilli that have found their way into the blood-current may set up primary disease of a bone or joint. In fact, it is stated by König that in 14 out of 67 autopsies on subjects who have suffered from tuberculous disease of the bones and joints, no other foci were found in the body. And in other instances the source of infection may be preëxistent disease of the lungs or of other internal organs.

Symptoms.

Tuberculous disease of the hip-joint is a chronic, insidious affection, characterized by occasional exacerbation of more acute symptoms that are induced by overstrain or injury, by a more rapid advance of the destructive process, or by infection with pyogenic germs. In the early state of the disease the joint is simply sensitive, and the symptoms vary according to the activity of the disease, which may increase the tension within the bone, the susceptibility of the patient, and the strain to which the weakened part is subjected. This sensitiveness is shown by the involuntary adaptation of the body to the weakness of the affected part, or, as popularly expressed, the patient favors the leg. The first symptom usually noticed is a slight limp. A limp in a child should never be considered a trifling affair, but should always lead to a careful examination of the lower extremities, because it is the first evidence of a number of grave diseases. The hip limp is peculiar and can be recognized readily. It is due to tenderness and muscular spasm. The spasm reduces the amount of free motion in the joint, and, when the patient steps forward with the affected limb, instead of bending the hip freely, he bends the spine and swings the pelvis and the limb forward together. Muscular spasm and consequent limitation of motion develop very early and are the most important symptoms from a diagnostic stand-

point. This spasm is probably reflex, and is due to irritation of the nerves supplying the joint. Nature is trying to put the joint at rest by placing all the muscles on guard. This constant contraction of the muscles very soon causes deformity. There is always flexion, sometimes with abduction and outward rotation, but more frequently with abduction and inward rotation. Where abduction is present at first, it soon changes to adduction. This change is not due to intra-articular pressure, because it takes place when there is no effusion in the joint. It is undoubtedly due to the muscular spasm. When abduction and outward rotation are present, there is apparent lengthening. The affected limb seems to be longer than its fellow, whether the child is lying on his back or standing. The position is due to tilting of the pelvis. With adduction and inward rotation there is apparent shortening. In the early stage of the disease the shortening is only apparent, but later may become real, on account of destruction of the head of the bone. Pain may be very slight or very severe in the early stage. It is usually a prominent symptom, and is most frequently located at the inner side of the knee. The patient may be entirely free from pain all day and yet suffer all night. When the child is suffering and the thigh is flexed, he will usually be found with the bottom of the foot of the well side resting on the instep of the affected side, making an effort at extension. In the beginning of what is sometimes called the second stage, all the symptoms of the early stage are exaggerated. The deformity is increased, and the shortening may be real. Pain is a constant symptom, and the "night-cries" begin. This night-cry is quite peculiar: it is a loud shriek, occurring when the child is asleep. The cry may be so loud as to waken others, but the child may not waken. It is probably due to a sudden spasm of the muscles, causing pain of short duration. Abduction may be present, but adduction is the usual position. The deformity is well marked and atrophy is decided. The limp is increased, and the patient may not be able to stand upon the limb. The gluteofemoral crease has entirely disappeared, and the joint is quite fixed. In fact, the symptoms are all so well marked that the laity can make the diagnosis. Unfortunately, it is at this late stage that the child is brought to the surgeon. In addition to the symptoms that have been described we may have suppuration and abscess, and, if the joint can be moved, crepitation may be felt. The original focus of disease has broken down, and all the joint structures are involved. Abscess as a complication occurs in a large percentage of cases that have not been recognized and properly treated in the early stage of the disease. The presence of an abscess usually indicates that suppuration is going on in the joint, although it may be entirely peri-articular, owing to the breaking of the original focus outside of the capsule of the joint. At this stage of the disease a peri-arthritis is present and can usually be felt around the trochanter. There is fever, the temperature running from 99° to 102° F.,

and is greatest when the abscess has opened and sinuses are present. At the time when the original focus breaks through into the joint, there is a decided rise of temperature, and after an abscess has broken externally, the patient suffers from a rise of temperature, due to infection of the abscess-cavity by pyogenic germs. This usually disappears after a few days, but occasionally the patient rapidly emaciates and dies, the high temperature continuing until death. During the later stage of the disease the general health suffers greatly, and death occurs from tubercular meningitis, pulmonary tuberculosis, and amyloid changes in the liver and kidneys.

Diagnosis.

The diagnosis offers no difficulty when the symptoms are all well marked and when the characteristic deformity is present, but it is of the utmost importance that it be made at an early date in order that the treatment may be successfully applied. The temperature offers no help in diagnosis, because it varies so, and may be entirely absent. The pain located at the inner side of the knee is suggestive, but not conclusive. The fact that no pain exists is no proof of the absence of hip-joint disease, because cases occur without pain. Deformity helps to make a diagnosis, but it is important to make the diagnosis before this symptom is well marked. A certain amount of deformity occurs at a very early date. Another valuable symptom is muscular spasm. The spasm is gentle, involuntary jerking in the opposite direction from that in which the limb is being moved. It is a very constant symptom, but should be noted early in the examination, since repeated manipulations tire the muscle so that the spasm may disappear for a time. When involuntary resistance to motion in every direction is present with muscular spasm, the joint is diseased beyond question; for while many things may interfere with motion in certain directions, nothing else will give this complete train of symptoms. Spasm will be found in all stages of the disease, so long as any motion in the joint remains, and its disappearance is evidence of recovery. These manipulations can be satisfactorily performed upon patients of any age, if the surgeon exercises patience and confines his manipulations to the sound limb until he has gained the patient's confidence. The family history is of no value in making a diagnosis; in fact, it is rather misleading. The general condition of the patient is rarely of value in diagnosis, since the general health is rarely affected until the disease is well advanced. A number of affections are to be differentiated from hip-joint disease. It is very frequently pronounced rheumatism, but should not be, because rheumatism is an acute polyarticular disease. Pott's disease in the lumbar region may be mistaken for hip disease, for at a very early period it is occasionally difficult to make a differential diagnosis between these two affections. In Pott's disease there is the characteristic rigidity of the spine,

and except where a psoas abscess is crowding directly upon the joint, the limitation of motion is in extension only, motion in the other directions being quite free. The patient can stand upon the limb without causing pain, and manipulation of the limb does not cause spasm except in extension.

Atrophy.—Atrophy is an important sign of hip-joint disease. It is often appreciable to the eye and to the hand, and is always demonstrable by measurement. It is an important symptom because, if well marked, it shows that the disease must have existed for some time, whatever may be the statement of the patient's relatives. The atrophy affects the muscles of the entire limb, although it is somewhat more marked in the muscles of the thigh than in the calf. In the ordinary case of hip disease in childhood, when the patient is first brought for treatment, it averages from one-half to one inch in the thigh, and somewhat less in the calf.

The *x*-Ray in Diagnosis.—Roentgen pictures are of far more value in demonstrating deformity than in establishing early diagnosis of disease, especially at the hip in early childhood, when so large a part of the extremity of the femur is cartilaginous. The *x*-ray pictures are of value, however, in showing the destructive effect of the disease on the head of the femur or acetabulum, and thus giving one a clearer conception of the actual condition of the joint than would be possible otherwise. In older subjects it might be possible to demonstrate the presence of disease in the interior of the bone by this means, but in any event Roentgen pictures are of value only when interpreted by knowledge of the physical signs.

Treatment.

The treatment of hip-joint disease may be divided into constitutional and local. If mentioned according to their importance, it would be local and constitutional. It should be remembered always that it is primarily a local inflammation and should be treated as a local affection.

The local treatment is either mechanical or operative. Mechanical treatment is applicable in the vast majority of cases. The great principle of treatment in this disease is rest, and the mechanism that carries out this principle best is the one that should be chosen. The best results are not to be obtained by applying exactly the same variety of appliance to every case. There are those who advocate traction and those who advocate fixation. Both methods have their place in the treatment of this affection. The great advantage in simple fixation is that it can be secured by simple means that are always at hand, and that can be applied by comparatively inexperienced hands, while traction without confining the patient to bed can only be secured by special appliances that require special skill in their application. While the majority of cases can be successfully treated by simple fixation, a certain number will continue to suffer pain and do badly until traction is applied.

On the other hand, there are cases that do better with fixation than with traction. The fact that the advocates of traction and of fixation each claim the superiority of their respective methods by statistics from their practice, simply shows that each has acquired special skill in the use of his favorite method, and has given the method credit which properly belongs to his skill. If the best results of representatives of each faction be compared, they will be found to be practically the same. I believe that the surgeon who is without prejudice in this matter, and who will select his cases for the respective methods, will secure the best average results. When first called to a patient who is suffering severely and who has marked deformity, the surgeon can afford his patient the quickest and wisest relief by putting him in bed and applying traction by means of weight and pulley, usually called Buck's extension. The amount of weight varies with the size of the patient and in different cases. When the patient is a child, half a brick is a good weight to begin with, and it is rarely necessary to apply more than two bricks to an adult, for it is not so much the amount of the traction as its persistency that overcomes spasm. A bag of sand is a very convenient weight, since it can be so easily made lighter or heavier, to meet indications. The amount of weight in a given case should be just what the surgeon finds will overcome the muscular spasm and relieve the pain; too much weight will cause the patient more pain. The tendency, on the part of the patient, to slide down in bed can be best overcome by elevating the foot of the bed from two to four inches. Theoretically, the traction should be in line with the deformity, but practically I have found that it is rarely necessary to make any special provision for this, since the patient will place himself in bed in such a position as affords him the most relief and does him the most good.

If taken in the early stage, two or three weeks in bed with proper extension will usually be sufficient to relieve the pain and overcome deformity. A child that has been suffering without proper treatment until it has become emaciated will often regain its flesh very rapidly under this plan of treatment. The patient should be gotten out of bed as soon as possible, so that he can have the benefit of outdoor life. When the deformity yields promptly to this treatment in bed, and the joint is not exceptionally sensitive, the chances are that a fixation apparatus will bring the case to a favorable termination. I usually apply plaster-of-Paris from just above the knee to the ribs. This material is chosen because it is always at hand, and can be quickly and easily applied, and because it yields good results. It is a great boon in charity work because of its cheapness. The plaster should be applied over a close-fitting garment or a layer of bandage, and should be heavy enough to have the necessary strength without being a burden. The shoe on the well side should be elevated from 2½ to 3½ inches, and a pair of crutches used; for if there is not plenty of elevation, the child will begin to use the affected limb

as soon as the weight upon it does not cause decided pain. The cheapest and best way to elevate the shoe is to have a block of light wood the shape of the sole of the shoe, and of the proper weight, hollowed out so as to make it as light as possible, and fastened to the bottom of the shoe by screws coming through from the inside of the shoe. This block can be painted black and can be made very presentable. If something better is desired, a cork sole covered with leather is best. It is needless to say that the elevated shoe should be on the well limb. The patient must be under the constant care and supervision of a competent physician until all pain and spasm are gone, which will vary from six months to two years.

Constitutional Treatment.—If there is one point that has been emphasized by the newer ideas on the treatment of tuberculosis, it is that everything must be done to strengthen the defenses of the system against the encroachments of the tubercle bacilli; whether it is pulmonary tuberculosis or tuberculosis of joints, the salient idea is to increase the vital resistance by fresh air, sunlight, and proper nutrition. To a great extent this plan holds good in surgical tuberculosis, and it is only necessary to instance the remarkable results that have been achieved in recent years in cases of tuberculosis of the various joints by an outdoor life, particularly at the seaside, and without resort to operative measures. Tuberculosis is still a battle-ground between what might be termed the radical surgeons, who see in every tuberculous focus a lesion which must be thoroughly removed, and those who maintain a more conservative attitude, considering operation as only one of the elements in the treatment. In the Bradshaw lectures, Mr. R. J. Godlee, of London, expresses himself in general as favorably inclined toward the new vaccine therapy in tuberculosis; his experience leads him to state that it is impossible at the present time to promise uniformly good results, and that he is far from convinced that it is destined to replace all other medical and surgical measures. When it is considered that many cases of tuberculosis in different parts of the body recover under hygienic treatment alone, and that no treatment can restore what has been irreparably destroyed by disease, it cannot be expected that vaccine therapy will prove more than a valuable adjunct to other treatment.

Arthritis Tuberculosa de la Cadera.—(Weeks.)

El tratamiento local se divide en tratamiento mecánico y operativo. El gran principio del tratamiento local es el descanso de la parte afectada. Esta puede hacerse por medio de la tracción ó por la fijación según las indicaciones del caso.

Tratamiento Constitucional.—Si existe un punto de verdadera importancia en las ideas modernas sobre el tratamiento de la tuberculosis, éste

es el hacer todos los esfuerzos en la fortificación del organismo contra la invasión del bacilo de la tuberculosis: bien que la afección sea pulmonar ó de las articulaciones, la idea saliente es de aumentar las resistencias vitales por medio del aire puro, los rayos solares y una nutrición apropiada. Resultados remarcables se han obtenido últimamente en los casos de tuberculosis en las diferentes articulaciones por medio de la vida al aire libre, particularmente a las orillas del mar, sin tener necesidad de recurir á las medidas operativas.

En las conferencias de Bradshaw, Mr. R. J. Godlee, de Londres, se expresa en un sentido favorable hacia las medidas terapéuticas de la vacuna en el tratamiento de la tuberculosis. Al presente solo podemos decir que este procedimiento puede talvez llegar a ser un adjunto á los otros tratamientos.

Arthrite Tuberculeuse de la Hanche.—(WEEKS.)

Le *traitement local* se divise en traitement mécanique et opératoire. Le grand principe du traitement local, c'est le repos de l'articulation affectée. On peut l'obtenir par traction et fixation, l'un ou l'autre, ou tous les deux, suivant les indications.

Traitement Constitutionnel.—S'il est une chose démontrée par les principes les plus recents du traitement de la tuberculose, c'est qu'il ne faut rien négliger pour augmenter la résistance du système à l'invasion du bacille tuberculeux: qu'il s'agisse de la tuberculose pulmonaire ou de la tuberculose articulaire, l'idée dominante est d'accroître la résistance vitale par le grand air, le soleil et une alimentation convenable. On a obtenu récemment des résultats remarquables dans les différents cas de tuberculose articulaire par la vie au grand air, surtout au bord de la mer, sans recourir aux moyens opératoires.

Dans les conférences Bradshaw, M. R. J. Godlee, de Londres, se déclare généralement en faveur de la nouvelle thérapie vaccinale dans le traitement de la tuberculose. Tout ce que nous pouvons dire à l'heure présente, c'est qu'elle peut aider considérablement les autres traitements.

Tuberculöse Arthritis des Hüftgelenks.—(WEEKS.)

Behandlung—locale und allgemeine.

Locale Behandlung kann eine mechanische oder operative sein. Das Hauptprincip bei localer Behandlung ist die Ruhe für das afficirte Gelenk. Dieselbe kann bewerkstelligt werden entweder durch Zug, oder durch Fixation, oder durch beides zugleich, je nach der Indication in gegebenem Falle.

Allgemeine Behandlung.—In den neueren Ansichten über Behandlung

der Tuberculose tritt ein Punkt mit besonderer Nachdrücklichkeit in den Vordergrund, nämlich: dass alles gethan werden muss, um die im Körper vorhandenen Schutzmittel gegen das Eindringen der Tuberkelbacillen zu kräftigen. Ob es sich um Lungentuberculose handelt oder um Tuberculose der Gelenke, immer muss das Hauptbestreben bleiben, durch frische Luft, Sonnenlicht, und angemessene Nahrung die vorhandene vitale Widerstandsfähigkeit zu erhöhen. Bemerkenswerthe Resultate sind in den letzten Jahren bei Tuberculose der verschiedenen Gelenke erreicht worden durch Aufenthalt in frischer Luft, besonders am Meeresstrande, und ohne von operativen Eingriffen Gebrauch zu machen. Herr R. J. Godlee, in London, hat sich bei Gelegenheit der Bradshaw Vorträge im allgemeinen zu Gunsten der neuen Behandlung der Tuberculose durch Impfung ausgesprochen. Alles was man zur Zeit darüber sagen kann ist, dass dieselbe sich vielleicht als werthvolles Hülfsmittel neben anderen Behandlungsmethoden erweisen wird.

DISCUSSION.

Dr. Willy Meyer (New York) said there could be no doubt that in the last twenty-five years the pendulum had swung toward conservatism in the treatment of these cases. In the beginning of antisepsis, thirty years ago, almost every surgeon attacked the hip-joint by means of resection. So far it had been impossible successfully to apply the Bier treatment to the hip-joint. The hip-joint was supplied by the internal iliac vessels, and the iliac vein could not be compressed. He had made attempts to compress the inferior vena cava. This was difficult and painful, and yet he believed this was the only solution of the problem. It might be possible to construct cups, but they would have to fit very snugly about the hip. Many links were necessary to complete the chain in the treatment of tuberculosis—and tuberculin, hyperemia, and hygienic and dietetic treatment were very important links in this chain.

Dr. John Lindahl (Denver, Colorado) said there was an important anatomic fact in connection with joint disease, and that was that the joint was supplied by the same nerve that supplied the surrounding muscles. This accounted for the spasm of the muscles in these cases. These spasms were particularly injurious at night. To control these spasms he had been in the habit of using a firm bandage applied to the thigh and hip. He had also used a canvas casing, which could be buckled on. He had never been able to apply a plaster-of-Paris dressing that would control the spasms for more than three or four days, because there was always a tendency for it to become loose on account of the absorption of the fat.

THE TREATMENT OF TUBERCULOUS HIP DISEASE BY WEIGHT-BEARING AND FIXATION BY THE LORENZ SHORT HIP SPICA.

By H. Augustus Wilson, M.D.,
Professor of Orthopedic Surgery, Jefferson Medical College, Philadelphia.

The discovery of the bacillus of tuberculosis by Koch in 1882 marked an important epoch in bone tuberculosis. Historically, much of interest could be related regarding the various forms of treatment, which seemed to be based upon accomplishing inactivity. At the present date, after years of labor with various sera, little evidence of a specific remedy is advanced. Serum-therapy is of undoubted value both in diagnosis and in treatment. Tuberculous hip disease has been a most difficult problem to the surgeon, and a greater one to the patient. A brief discussion of the generally accepted basic principles of treatment is quite essential before considering the advantages of the weight-bearing method.

It has been customary to aim at securing absolute rest for the affected hip by placing the patient in bed, usually for months at a time. In addition, extension was applied so as to overcome muscle-spasm and, as many erroneously thought, to separate the articulating surfaces of the joint. Later, as the pain subsided and the patient showed improvement, the extension brace was applied, allowing the patient to use crutches while walking on the unaffected limb. It is quite obvious that the confinement to bed and the inactive life were accountable for the frail and anemic condition of so many of these patients. In like manner abscess formations, chronic sinuses, pathological dislocations, and secondary involvements can be accounted for. Since the introduction of fresh air, sunlight, and dietetic therapy, the end-results have been of a higher order. Amyloid degeneration does not appear to be of the same frequency as heretofore. Patients rarely become emaciated to the extent formerly observed.

In 1902 I became mildly impressed by the statement of Lorenz,[1] "Nobody has a right to place a coxitic child in bed because it has a diseased hip, for almost invariably its health will fail," and later by his two papers[6] advocating weight-bearing with the short spica. I now believe that it should be the preferable method, to the exclusion of all forms of inactivity, modified only when peculiar conditions of pain, etc., demand temporary rest.

I am convinced that a joint that has had its articulating surfaces extensively denuded by a pathological process is not capable of function, and friction should be avoided. The continued friction of such joints tends to increase irritation. Motion should be inhibited, and ankylosis secured, by conservative measures if possible, or by operative procedure if necessary. Definite proof exists that prolonged fixation of a normal joint not involved in an inflammatory process does not produce ankylosis. Quite similarly, a joint that is the site of a tuberculous osteitis does not necessarily become ankylosed by fixation during a period of three years. It is apparent that the employment of the spica does not necessarily result in ankylosis. Resolution may take place without extensive destruction of joint surfaces, and a movable joint may result where recovery follows the early recognition and early adoption of the methods here advocated. It has always been observed that children with hip tuberculosis would step upon the foot upon the affected side whenever they could do so without pain, and this could not be prevented by braces or crutches. It is not uncommon for an orthopedic surgeon to see cases of ankylosis of the hip following tuberculous disease in which, from failure of recognition or otherwise, no treatment has ever been employed. The so-called "nature's cure" is only objectionable in the sense that the deformity is usually an unfavorable one, requiring correction by operative means. The treatment of tuberculous hip disease by the short spica possesses all the advantages of "nature's cure," assisted by fixation, so as to prevent an unfavorable deformity and supplemented by rational hygiene. The patient walks about without the use of crutches, and activity is encouraged. This apparently radical departure from the principles previously advocated may seem quite erroneous to many, but, after careful consideration of its ultimate effects, will appear more plausible and rational.

The excellent results obtained by Bier's hyperemic treatment require deep thought in relation to tuberculous hip disease. Bier has proved that a large blood-supply to a part is almost invariably detrimental to the progress of organisms, and increases the resistance to invasion. Weight-bearing is conducive to the benefits obtained by outdoor life, and, in turn, prevents circulatory stasis, thereby securing the benefits obtained by the hyperemic method of Bier. Objection has been raised that such ambulatory methods tend to induce pathological dislocation, because a bone affected with tuberculosis is soft and will yield to pressure. Experience has shown that when the affected part is placed in the proper position, pathological dislocation does not occur with the same frequency as has been noted in cases where it appeared to depend solely upon muscular actions. It is a well-known fact that pathological dislocations occurred with much more frequency prior to the employment of the ambulatory method of treatment, proving that weight-bearing is not necessarily an etiological factor in its

production. As aforesaid, I believe improper position and grinding of joint surfaces are causative factors. The location of the lesion is none the less important, for it is well known that if the acetabulum is primarily involved, more difficulty is usually encountered than if the disease is located in the trochanter or cervical epiphysis. In treating these cases, however, no clinical distinction is made even after locating the lesion by the radiograph. The best results are obtained in the incipient cases and those involving other anatomical structures than the acetabulum. In considering the dried specimens in the various museums all over the world, one must be impressed with the evidence of destructive grinding and friction in joints whose surfaces were largely destroyed by the former tuberculous osteitis, and reach a decision as to whether such joints would not have been better ankylosed.

Adams[5] has found that ambulatory cases of tuberculous joints do better than those confined and inactive. The reason for this is quite apparent, as was aforementioned. The advantage of treating these cases by the plaster spica is briefly described by Ely:[3] "It dispenses with the aid of the brace-maker; it does not require constant supervision; it is not unsightly; it permits the patient to use the limb in walking, and so avoids extreme atrophy, that always accompanies the use of the extension splint. Its objections: first, it can rarely be used when an open abscess is present with much discharge; secondly, it requires some skill in its application." The proof of the efficacy of this method is strongly manifested by the increase in general health and gain in weight, the marked muscular development of the affected leg, which frequently necessitates the change of cast. It is quite obvious that flexion and extension of the leg, movement of the upper trunk, and ambulation are conducive to the much-wanted blood-supply. I have elsewhere reviewed at length the advantages of outdoor life versus confinement in the treatment of bone tuberculosis.[10]

It would simply be repetition to review the character of climate and forms of diet, but it must be a foregone conclusion that if hygiene is neglected and diet not considered, the treatment of these cases will not terminate favorably. Carling[4] says: "Open-air treatment is not a fad; it is an absolute necessity for the speedy and permanent cure of tuberculous and other forms of bone and joint disease. In brief, sunlight, fresh air, and activity are essential, milk and egg diet quite as important, though forced feeding I do not advocate. Tonics are of little service and are rarely indicated. Sanatoriums are by no means essential, but home life with proper outdoor therapy is preferable." Suitable well-ventilated sleeping arrangements can easily be secured in almost any room.

The most desirable position for fixation of the leg by the spica is that of twenty degrees of flexion, twenty degrees abduction, and five degrees external rotation. This posture overcomes, to a certain extent, any shorten-

ing, should it occur; it directs pressure toward the center of the acetabulum, and facilitates ambulation. The plaster-of-Paris spica is applied, extending from the margin of the ribs to the knee. In cases where muscular spasm requires temporary relief the cast may be carried below the knee, and subsequently changed when the spasm passes away. It has been a matter of frequent observation that the casts become too tight in patients who have been inactive previously, and this necessitates a renewal of the cast. The explanation of this was found to be the extensive muscular development of the leg, due to its activity, thereby indicating the great advantages being obtained. Not infrequently cases are encountered in which pain is most severe over the great trochanter or about the joint itself, indicating an intracapsular tension due to an abscess or exudate within the capsule. It is important that recurring pain in tuberculous hips should not be considered as the so-called acute stage,[11] but as evidence of tension, usually of transient character. In this type of case it is difficult to offer immediate relief by any other method than cutting, but, if possible, the conservative plan should be followed, thus preventing an open tuberculous wound. Cast changes should be made every two or three months, depending on the progress made by the patient. Goldthwait[7] has reported a number of cases in which he has employed the combined method of rest and fixation with activity by using crutches and no weight-bearing during the period of acute pain. In several cases I have been compelled to resort to this method, but always with reluctance, for I firmly believe crutch activity to be quite inferior to the weight-bearing. It is usually a safe rule to be guided by the child's instincts, for he will not walk when to do so will cause pain.

It is well known that many of the so-called cold or tuberculous abscesses disappear without operative intervention, depending upon the general health and resistance of the patient.[14] With this constantly in mind, and knowing the chronicity of the sinus, it has been my rule never to open an abscess of this type unless absolutely necessary. If, however, there is danger of rupture or by pressure it causes excruciating pain, incision or aspiration is indicated. After opening the abscess, its cavity is thoroughly cleansed by dry sterile gauze, and the skin and deeper tissues sutured without drainage. The principles of Treves' operation[8] for psoas abscess can be applied to any tuberculous abscess. About 50 per cent. of abscesses so treated heal within a period of ten days or two weeks. The drainage method always tends to encourage a sinus, and should not be used.[15] The chronic sinuses following the opening or rupture of abscesses are even more difficult to treat than the abscesses themselves. Beck[2] has recently advocated the injection of a bismuth-vaselin and later a bismuth-paraffin preparation, which has shown very excellent results. Personal experience with Beck's bismuth paste indicates that it will revolutionize the treatment of sinus tracts. In-

stead of washing them with various solutions, they will be kept dry. Keeping the tracts wet encourages their continuance, aids in the formation of fungus-like growth lining the sides, whereas, if the moisture can be excluded, rapid closure and sound healing are the rule in all cases except where sequestra are present. It is not an unusual occurrence to witness the closure, within three weeks, of sinuses which have been dribbling pus for many years. Beck's method deserves recognition as one of the most important additions to the rational treatment of bone tuberculosis.

BIBLIOGRAPHY.

1. Adolph Lorenz: "The Final Terminations of the Treatment of Coxitis and the Simplest Remedies." Original paper.
2. Emil G. Beck: "Fistulous Tracts, Tuberculous Sinuses, and Abscess Cavities," Jour. Amer. Med. Assoc., March 14, 1908.
3. Leonard W. Ely: "The Treatment of Joint Tuberculosis in Children," Med. Rec., December, 1907.
4. John Carling: "Open-air Treatment of Tuberculous Bone and Joint Diseases," New York Med. Jour., June 8, 1907.
5. John D. Adams: "A Report of Seventeen Cases in Open-air Treatment for Surgical Tuberculosis in Children," Boston Med. and Surg. Jour., January 18, 1906.
6. Adolph Lorenz: "The Simplest Mechanical Method of Treating Coxitis and Its Results," Amer. Jour. Orthop. Surg., October, 1906, p. 150.
7. J. E. Goldthwait: "Treatment of Tuberculosis of the Hip," Boston Med. and Surg. Jour., February, 1907.
8. Treves: "Manual of Operative Surgery," edit. 1903, vol. ii, p. 772.
9. H. Augustus Wilson: "Modern Tendencies in the Treatment of Bone Tuberculosis," Amer. Med., November, 1907.
10. Ibid.: "Outdoor Life versus Confinement in the Treatment of Bone Tuberculosis," Penn. Med. Jour., January, 1906.
11. Ibid.: "The Clinical Significance of the So-called Acute State of Bone Tuberculosis," Penn. Med. Jour., July, 1907.
12. Ibid.: "Tuberculous Joint Diseases," New York Med. Jour., March, 1902.
13. Ibid.: "Medico-legal Aspect of Tuberculous Joint Disease," Amer. Med., July, 1901.
14. Ibid.: "Apparently Unavoidable Errors in the Diagnosis of Psoas Abscess," Amer. Med., vol. x, No. 2, pp. 55–57.
15. Ibid.: "Pus in the Pelvis as a Result of Bone or Joint Necrosis; Diagnosis and Treatment," Amer. Med., vol. iv, No. 23, December, 1902.

El Tratamiento por Medio de la Carga de Pesos y el Fijamiento al Espigón de la Cadera, de Lorenz.—(Wilson.)

La importancia de la carga de pesos se ve demostrada en los efectos benéficos de la vida en las afueras. La actividad constitucional previene la estasis en la circulacion. La falta de uso consecuente al confinamiento y la inactividad favorece la atrofia. La carga de pesos sin fijamiento, bajo condiciones favorables, puede producir la recuperación, mas con anquilosis en la postura deformada. La carga de pesos con el espigón de la cadera, recomendado por Lorenz, facilita la vida en las afueras y también acorta el

tiempo del tratamiento. Los resultados demuestran una función normal completa cuando empleada en casos apropiados. Recuperación rápida en algunos casos con abscesos y en otros una lenta, mas permanente, recuperación. Inyecciones del bismuto de Beck en las fistulas. Profunda anquilosis en los casos previamente guardados en la cama ó en aquellos en los cuales existe una atrofia debida à la falta de uso producida por medio del uso de muletas. El desarrollo muscular de la parte atrofiada, con frecuencia requiere el cambio del molde lo que demuestra los efectos beneficos del tratamiento. La carga de pesos con el fijamiento ayuda en el procuramilento de los efectos benéficos de la Hiperemia de Bier. Tratamiento constitucional, dieta. Dislocación patológica puede ocurrir cuando la posición del fijamiento es inapropiada. La postura mas favorable es de la de viente grados de flexión, veinte grados de abducción y cinco grades de una rotación external.

Die Behandlung von tuberculösen Hüftenerkrankungen mit Lastentragen, und Fixation mit Lorenz'scher Hüften-Spica.—(Wilson.)

Die wohlthuende Wirkung des Aufenthaltes in frischer Luft wird durch das Lastentragen unterstützt. Allgemeine körperliche Thätigkeit verhindert Stockungen des Blutkreislaufes. Bettlägerigkeit und Unthätigkeit begünstigen Atrophie von Nichtgebrauch. Das Lastentragen ohne Fixation kann unter besonders günstigen Umständen zwar zur Heilung führen, geht aber mit Ankylose in entstellter Lage einher. Das Lastentragen mit einer Lorenz'schen Hüften-Spica erleichtert den Aufenthalt im Freien und kürzt die Behandlungszeit ab. Wenn in geeigneten Fällen angewandt, ist eine normale Funktion die Folge. In einigen Fällen von Abscessbildungen findet eine Wiederherstellung schnell statt, in anderen Fällen geschieht die Wiederherstellung langsamer aber dauernd. Über Beck's Bismutheinspritzungen in Fistelgängen. Über gute Ankylose in Fällen, in denen Bettlägerigkeit vorausgegangen war, oder in denen die Atrophie von Nichtgebrauch durch Benutzung von Krücken hervorgebracht wurde. Entwicklung der Muskulatur an einem atrophirten Beine erfordert oft ein häufigeres Wechseln des Gypsverbandes, das zeigt aber den erreichten guten Erfolg an. Das Lastentragen mit gleichzeitiger Fixation wirkt fördernd auf die Erreichung günstigerer Einflüsse von der Bier'schen Hyperämie. Über allgemeine Behandlung. Über Diät. Pathologische Verrenkungen können durch unzweckmässige Lage bei der Fixation hervorgebracht werden. Die am meisten günstige Lage ist diejenige von zwanzig Grad Flexion, zwanzig Grad Abduction, und fünf Grad Rotation nach aussen.

VACCINE THERAPY IN JOINT TUBERCULOSIS.

By Edward H. Ochsner, B.S., M.D.,

Attending Surgeon to Augustana Hospital; Adjunct Professor of Clinical Surgery, University of Illinois, Chicago.

Before taking up the subject of vaccine therapy as related to joint tuberculosis, I wish to state that I consider it, when properly controlled by reading the opsonic index, a very valuable adjunct in the treatment of tubercular joints, but in order not to be misunderstood, I wish to emphasize that there are other therapeutic agents which are quite as essential to the successful treatment of this affection and should never be lost sight of or neglected. I refer to proper hygienic conditions, such as plenty of fresh air, sufficient suitable food, prevention of secondary infection, and proper immobilization. I will, however, confine myself in these remarks to a consideration of the influence of proper immobilization and vaccine therapy upon the progress of the disease, and the ultimate functional result, with special reference to the mobility of the joint.

I take it for granted that this audience is thoroughly familiar with the principles of vaccine therapy as taught and practised by Wright, and consequently will not go into this detail further than to say that, while I agree with the critics of Wright that the opsonic index cannot be determined with absolute accuracy, I believe that a careful, conscientious laboratory worker can ascertain such variation in the opsonic index as is essential to avoid the administration of such large or frequently administered doses of vaccine as would cause too great a depression of the opsonic index, or to administer a new dose during a pronounced negative phase. This, after all, I consider the most important reason for a careful reading of the opsonic index.

If patients with joint tuberculosis come to the surgeon sufficiently early; if they are placed under proper hygienic conditions; if suitable measures are adopted for the prevention of secondary infection; if the joints are perfectly immobilized for a sufficient length of time, and if vaccine therapy is instituted under control of the opsonic index, I believe that the great majority of cases will secure perfect or nearly perfect functional and anatomic results.

Many teachers have taught and are still teaching that long-continued immobilization of an inflamed joint favors ankylosis. This teaching is

theoretically untenable, and contrary to clinical experience, as I believe we will be able to prove.

Volkman taught us, and I believe correctly, that the primary lesion in joint tuberculosis is usually located in the bone, and that in the majority of cases the joint involvement is secondary. Clinically, the first thing that is usually noted is a moderate degree of pain, followed, in a varying period of time, by an effusion into the joint and an attempt at immobilization of the joint by the surrounding muscles. The two signs, effusion and rigidity, should long ago have taught us that when an inflammatory process exists in a joint, our efforts should be directed toward preventing contact and friction between the opposing articular surfaces. This can best be accomplished by sufficiently prolonged absolute immobilization of the joint. If active and passive motion are permitted, or, as is sometimes done, even encouraged, the endothelial coverings of the joint cartilages are very apt to be damaged. If two opposing surfaces become thus abraded, we are almost sure to have fibrous ankylosis. If active and passive motion is vigorous enough and prolonged enough, the cartilage also will become destroyed in places, and if opposing surfaces of the joint cartilages become destroyed, bony ankylosis is sure to follow. Proper immobilization with undisturbed joint effusion will prevent this undesirable termination in a very considerable percentage of cases, especially if it is further aided by vaccine therapy.

For the past two years we have been using vaccine treatment as a routine procedure in all our cases of tuberculosis for whom it was convenient to remain in or near the city, and rather early in our experience it seemed to me that tubercular cases thus treated reacted more quickly, and in joint tuberculosis it appeared that when the last cast was removed, ankylosis of the joint was less common and less severe. It is, of course, too early to reach absolutely definite conclusions on this point, as many of the cases are still under treatment, and the final findings cannot yet be recorded. However, the greater mobility of the joints was sufficiently pronounced to attract my attention, and I have consequently since that time made a rather critical study of the patients, with special reference to this point, and naturally I tried to discover what the reason or reasons might be for this difference in the healing process.

About this time I had three very interesting cases of bilateral tubercular cervical adenitis. In each case I did a radical operation on one side, then placed the patient on vaccination treatment for from six to eight weeks, and then operated on the other side. In each case I noticed the following facts: The glands first operated upon had their ordinary gland capsule, but in addition a very considerable deposit of pericapsular connective tissue, the vascularity of the parts being about as is usually found in these cases. When operating the second time, quite a different condition was found. While

the gland capsule was about the same as at the first operation, the periglandular connective tissue had almost entirely disappeared, the glands were very much more freely movable, and the surrounding tissues were much more vascular than they had been at the previous operation—so vascular, in fact, that there was general capillary bleeding with every cut of the knife or snip of the scissors, interfering very seriously with rapid dissection. I have since observed the same condition twice, in fact, in all cases, five in number, in which there has been a considerable interval of vaccine treatment between the first and second operation.

If the above observation is correct, and if it will be substantiated by future cases and other observers, it will explain why there is less ankylosis in cases of joint tuberculosis treated with vaccination than is the case if treated by the ordinary method. We have long been taught that tuberculosis is cured by a process of exclusion, because this is the process we have been able to observe and follow as healing has progressed. So far as I know, other methods of healing have not been recognized, and yet it seems more than probable that there are other methods, for in the perfect healing out of a tubercular peritonitis it is hard to conceive that it has all been a process of exclusion and sclerosis. To further substantiate this view I might cite two cases of tubercular cervical adenitis which had received no vaccination treatment, in which there was little or no periglandular connective tissue found at the operation.

The healing process of tuberculosis is usually described as a proliferation of fixed tissue cells, which later develop into mature connective tissue, which, in contracting, slowly constrict and ultimately obliterate all the blood-vessels, resulting in fatty degeneration, then in necrosis, and finally ending in calcareous deposits. In other words, the tubercular process is walled in and the tubercle bacilli starved.

The process of healing, which we believe we have observed here, is evidently entirely different: it is fundamentally a phagocytic process, a process of vascularization instead of sclerosis; it is a tearing down of the connective-tissue wall, giving the phagocytes an opportunity to destroy the tubercle bacilli. The two processes may be likened to the two recognized methods of warfare—one a siege with the cutting off of supplies and provisions and the ultimate starvation of the garrison, and the other the destruction of the walls of the fortress with heavy artillery, with a final charge and a hand-to-hand combat with the garrison.

I do not wish to consume your time with a detailed report of the cases thus treated, nor even with a statistical summary, but will briefly give the history of two cases, one a simple tuberculosis of the knee, the other a tuberculosis of the knee complicated by mixed infection. In this way I hope to be able to emphasize and elucidate some of the points above brought out.

H. H., male, aged seventeen, tailor. First placed himself under my care May 11, 1907, with a history of having been well to the age of fourteen, when he fell, injuring right knee, experiencing slight pain, but had no further trouble until four months later, when knee became swollen, painful, and motion restricted. Shortly after knee was aspirated, injected, and apparently rather ineffective attempts made to immobilize same. Later again injected; finally put on Bier's treatment. When first seen by me, general nutrition fair, weight, 145 pounds, examination negative except that right knee was greatly swollen, boggy, extremely painful on slightest passive motion, active motion impossible, held rigid at an angle of about 140 degrees, unable to bear weight, temperature varying during the course of the next week between 98⅗° and 100⅗°; pulse between 80 and 120; opsonic index, 0.6. As it was impossible to straighten the knee, the patient was anesthetized, the knee placed at an angle of 175 degrees, plaster-of-Paris cast applied from the malleoli to the tuber ischium, and vaccination treatment instituted. After a few days patient was allowed to get up; cast was left in place for four months, at the end of which time the patient had gained so much in weight that the cast had to be changed. The second cast was left in place eleven months. When this was removed, patient's general health was excellent; weight, 177 pounds. On inspection, knee perfectly normal, straight, active motion about 20 degrees, passive motion 30 degrees, opsonic index during the last year having varied between 1.1 and 1.7.

J. B., male, aged thirty-four, blacksmith. Came under my care on the 21st of May, 1907. The essential points of his history are that, twenty-eight months previously, after an illness described by him as la grippe, both lower extremities from the kness down to the toes became swollen. After the swelling subsided the patient noticed that the right leg could not be fully extended. This limitation of motion had persisted ever since. Fifteen months before his admission a swelling developed on the outer side, a little below the right knee. Eleven months before admission this abscess was incised and drained; three months later this was done again; drainage continued for three months and intermittently from that date until the day of admission. On admission the patient was found considerably emaciated, the right knee was markedly swollen, slightly flexed, rigid, but not completely ankylosed; active motion impossible; slightest attempt at passive motion caused excruciating pain; leg and foot swollen; drop ankle; several sinuses discharging pus. Temperature during the succeeding weeks varied between 97⅘° and 104° F.; pulse, 66 to 128; opsonic index on admission, 0.6. The patient was anesthetized, the right lower extremity immobilized in a fenestrated plaster-of-Paris cast, with the knee at an angle of 175 degrees and the ankle at 85 degrees; patient put to bed and vaccination treatment instituted. As soon as the extreme tenderness subsided, he was allowed to sit up, later to walk with crutches with a high sole under the good foot, and finally, when the tenderness in the knee-joint had entirely disappeared, he was allowed to walk with ordinary shoes and a cane. The patient rapidly gained in weight and strength, his temperature and pulse became normal, and when the last cast was removed on August 20, 1908, the right lower extremity, except for some atrophy of the muscles, made a practically normal appearance, the sinuses being entirely healed, and about 30 degrees passive motion being possible without the slightest pain or discomfort.

I feel sure that you will agree with me, even from these short histories, that here we had two very unfavorable cases, and that the results are certainly most satisfactory. If these were the only cases thus treated, they would prove very little, but we have had quite a series of similar cases involving practically every joint of the extremities in which we have secured similar gratifying results.

In conclusion I wish to state that I am very well aware of the fact that a relatively small number of cases covering a short period of time cannot furnish conclusive evidence, but the experience we have had thus far has been so uniform that I deemed it of sufficient importance to report thus briefly.

Up to a few years ago we were very well satisfied if we were able to bring a case of simple tubercular arthritis to a successful healing of the tubercular process without surgical intervention, and we were quite satisfied if we accomplished this result with ankylosis, providing the limb was ankylosed in a useful position. A larger joint with mixed infection sometimes resulted in the death of the patient, often in the loss of the limb, and very commonly in persisting sinuses. I believe that now we can practically always save the life and limb of such a patient, and sometimes, as in the last case above cited, even secure a useful joint. In tubercular joints uncomplicated with mixed infection we can, if the patients come to us sufficiently early, secure perfect functional and anatomical results in the great majority of cases.

Vacciua-terapia en la Tuberculosis de las Articulaciones.—(OCHSNER.)

La vaccina-terapia en la tuberculosis de las articulaciones, nunca deberá ser empleada sino en conexión con una cuidadosa observación del índex opsónico, y también esta deberá ser asociada con los otros procedimientos reconocidos en el tratamiento de la tuberculosis en general, tales como el aire puro, alimentación apropiada, inmobilización de la articulacion afectada, prevención de una infección secundaria, etc. Con este procedimiento se obtiene un por ciento conciderable de una cura perfecta, anatómica y funcional, por que el tratamiento de la vaccina produce una cura con la minima produción de tejido conjuntivo.

Thérapie vaccinale dans la tuberculose articulaire.—(OCHSNER.)

La thérapie vaccinale ne doit jamais être employée dans la tuberculose articulaire qu'après une contrôle soigneuse de l'index opsonique et en concomitance avec d'autres méthodes approuvées de traitement, telles que la

cure d'air, une alimentation appropriée, l'immobilisation de l'articulation, le traitement préventif de l'infection secondaire, etc.

Ainsi employée, elle permet d'obtenir un nombre considérable de parfaites guérisons anatomiques et fonctionnelles, parce que le traitement vaccinal produit une cure radicale avec la moindre formation de tissu conjonctif.

Vaccine-Behandlung bei Gelenks-Tuberkulose.—(Ochsner.)

Vaccine-Behandlung sollte bei Gelenks-Tuberkulose nie ohne sorgfältige Beachtung des opsonischen Indicis unternommen und stets in Gemeinschaft mit den übrigen anerkannten Behandlungsmethoden, als frische Luft, angemessene Ernährung, Fixation des Gelenkes, Verhinderung einer sekundären Infektion, etc., ausgeführt werden.

In dieser Weise ist ein sehr ansehnlicher Prozentsatz anatomischer und funktioneller Heilungen zu erzielen, da die Bindegewebs-Formation beim Heilungsprozesse nach Behandlung mit Vaccine eine minimale ist.

DISCUSSION.

Eugene Caravia, M. D. (New York) said: Dr. Cuguillere's vegetable serum is in the ninth year of its existence. Its principle is based on Koch's writings, who, in order to conquer tuberculosis, set himself the task of solving three propositions:

1. To determine and cultivate the pathogenic agent of tuberculosis.
2. To find out and classify all the agents able to attenuate its culture or kill it in vitro.
3. To find out a way to obtain the same effects in the animal and human organism.

Everybody knows how successful he has been in the first proposition by determining the staining reaction and cultivating the bacillus known by his name. To solve the second and third propositions Koch used successfully, but in vitro only, physical (heat, light, electricity) and chemical (acid bases) agents. But those agents could not be used in living beings.

Another line of experimentation brought Professor Koch to use a certain number of metals which have the power to kill rapidly and surely the cultures of Bacillus tuberculosis.

Rollin found that a non-oxidizable metal without radio-activity, like platinum in metal state, will totally prevent development of Aspergillus niger. Koch has found that cultures of Bacillus tuberculosis are killed in presence of even an infinitesimal solution of the salts of gold. Other metals

exhibit the same properties. Metalloids, like sulphur, chlorid, iodin, bromin, are as active, if not more so.

But those agents have been found without action on the bacillus in living organisms. "A healthy organism," says Dr. Cuguillere, "tolerates the absorption of metallic salts only with difficulty. An organism infected with tuberculosis is not able to retain those necessary for its own defense. It demineralizes itself, and, consequently, it seems impossible to assimilate new ones."

Then Professor Koch abandoned this line of investigation and declared that tuberculosis would be curable by the introduction, into the organism, of a remedy equally organic, hence his new researches on products elaborated by the Bacillus tuberculosis.

Dr. Cuguillere agrees with the opinion that tuberculosis can be cured by a living serum. But he thinks that, instead of toxins and antitoxins, this serum could be made to carry colloidal metals already assimilated, which are organic and living, and are possessed of their maximum activity. Consequently it is the mineral and vegetable kingdom that furnishes the active principle of his serum—that is, organic sulphur taken from fresh juices of brassica, allium, water-cress, horseradish, and other herbs known and for many years used as antiscorbutic and antirachitic remedies.

Dr. Cuguillere's serum is a yellow liquid having a strong odor of garlic. It produces a burning sensation, which disappears a few minutes after the injection. It is not toxic. One hypodermic injection of from 2 to 5 c.c. is given every week.

The formula, as given at the Congress of Tuberculosis in Paris, is:

Allylum sulphide*	1 gram.
Tinct. of myrrh	1 gram.
Hayem's glycerinated serum	100 grams.

Cuguillere, in a paper read before the International Congress of Medicine held in Biarritz, April, 1903, presented the history of several cases of coxalgia, osteo-arthritis of the foot- and knee-joints, with or without fungosities and suppuration, osteo-periostitis of the tibia, caries of the ribs, pleural tuberculosis, adenitis of the neck, tuberculous tumors of the breast, lupus, peritonitis, and salpingo-ovaritis.

Dr. Cuvelier, of Lens (Belgium), at the International Congress of Tuberculosis held in Paris in 1905, presented the history of 2 cases of coxalgia, 2 cases of white swelling of the knee, 1 of the wrist, and one of the elbow.

I have treated 2 cases of adenitis of the neck, 1 small subcutaneous tumor of the breast, 1 white swelling of the knee, and 1 of periostitis of the tibia. This last one developed two months after the removal of the right testicle for tuberculosis. In all these, as well as in numerous other cases, no other

* The synthetic allylum sulphide is inactive.

treatment has been used except Cuguillere's serum in weekly injections. From 3 to 12 subcutaneous injections were needed to bring about a recovery which was permanent, since months and years after cessation of the treatment there has been no relapse and no tuberculous manifestations in any part of the body. By the use of Cuguillere's vegetable serum alone abnormal temperature, high or low, becomes normal, appetite returns or increases, pain stops, swellings disappear, suppuration dries up, fungosities are resorbed, the movements of the articulations involved are preserved. The healing takes place by the fibroplastic process and by segmentation and gradual ingestion of Koch's bacilli by the leukocytes.

Except in cases of tuberculosis of the vertebræ immobilization is not required. Instead, moderate exercise and massage are recommended, and no matter how critical one may be, he cannot help, after testing Cuguillere's vegetable serum, but find that in surgical tuberculosis he will never need the knife, except, perhaps, when a necrosed bone has to be removed.

Dr. De Forest Willard (Philadelphia) thought the results obtained by Dr. Wilson, if carefully analyzed, were about the same as from other methods of treatment. If we could secure these cases early, there was no question but what all of us could secure good results. Fresh air and outdoor life were very important. The ambulatory treatment should not be used in the acute stage. Vaccine therapy and the Bier treatment were good, but no one thing would cure tuberculosis. The same applied to injections. We could do more in conquering tuberculosis by building up the resistance of the individual than by attempting to destroy tubercle bacilli.

Dr. Russell Bellamy (Wilmington, N. C.) believed climate was the most important factor in dealing with these cases. Seven-eighths of all the patients in the Hospital for Deformities in New York were from the slums of New York. He had seen splendid results from the use of the plaster spica.

Dr. Emil G. Beck (Chicago) said he would hesitate to use a needle where it was possible to inject iodoform or bismuth material into a vein, because death would follow in two minutes. He had proved this in experiments on guinea-pigs. He advocated the injection with a glass syringe of the bismuth paste after opening the abscesses.

Dr. A. T. Cabot (Boston) wished to call attention to one point in the handling of surgical tuberculous cases. Patients suffering from pulmonary tuberculosis were required to exercise care in the disposal of their sputum, but practically no attention was paid in hospitals or elsewhere to the disposal of surgical dressings from tuberculous cases. Such dressings should be immediately treated with boiling water, some suitable antiseptic, or burned.

Dr. Tunstall Taylor (Baltimore) said weight-bearing should not be used in acute cases, and should be confined to hospital and sanatorium treat-

ment, as it was sure to be meddled with if tried at home. The bivalve spica was best, because it would permit massage. Climatic treatment was very important. Vaccine therapy was also very useful. Braces and the prolonged use of traction had been very much overdone. On the other hand, he did not agree with Lorenz that early ankylosis in these cases was desirable.

Dr. Wilson, in closing, said the museums were full of specimens showing joint destruction from tuberculosis. A movable and functionating joint was always preferable when such function was not apt to be destructive to the surrounding tissues and to the health of the patient. But where there was great destruction the question came up as to whether it was better to have mobility or ankylosis, he was unable to answer the question.

Dr. Ochsner, in closing, said he wished it understood that vaccine therapy was not a cure-all; it was only a very valuable adjunct to the ordinary modes of treatment. He wished to lay special stress upon his observation that, by the proper application of vaccine therapy, he had been able to reduce the quantity of connective tissue in the healing of tuberculosis. He was sure that vaccine treatment would reduce the mortality somewhat. He was sure that, within the last two years, he had had several cases of joint tuberculosis which came with great sinus formations and secondary infection who would have died had they come five years earlier before the use of the vaccines. He firmly believed that morbidity would also be reduced by vaccine therapy in conjunction with other measures.

DEUX FORMES PARTICULIÈRES D'ARTHROPATHIES TUBERCULEUSES DU GENOU.

Par le Dr. Mauclaire,
Agrégé à la Faculté de Médecine de Paris.

J'en ai vue ici deux variétés anatomiques; dans la première il s'agit d'un épanchement à grains riziformes, dans la deuxième il s'agit d'un épanchement gélatinéforme.

(*a*) L'arthrite à grains riziformes a été observé chez une jeune femme de 29 ans, de très forte constitution, n'ayant aucune trace de tuberculose pulmonaire. L'affection débuta en Janvier, 1907, et j'examinai la malade trois mois après. Elle présentait tous les signes d'une hydrarthrose, mais à la pression on sentait la crépitation caractéristique. Je fis l'arthrotomie externe, l'évacuation de l'épanchement et le lavage phénique. La malade a guéri rapidement et porta une genouillère. Elle reprit une profession très active l'obligeant à marcher beaucoup. Je la revois tous les trois mois et aujourd'hui 15 mois après l'opération il n'y a aucune récidive locale, ni trace de tuberculose dans une autre part de l'économie.

Certes des observations semblables ne sont pas rares; toutefois ce qui est intéressant dans mon observation est la bénignité des suites opératoires et la persistance de la guérison; la plupart des arthrites à grains riziformes évoluant vers la synovite fongueuse. Il s'agit donc en somme d'une tuberculose articulaire atténuée.

(*b*) L'arthrite à épanchement gélatinéforme du genou a été observée chez une jeune femme de 32 ans. Les symptômes étaient ceux d'une tumeur-blanche typique. Apres l'incision pour faire une résection, je fus surpris de trouver dans l'articulation un épanchement gélatinéforme assez abondant. Les surfaces articulaires elles mêmes étaient peu lésées. Il y avait quelque fongosité articulaire et une ostéite tuberculeuse de la tête du genou.

Je fis la résection du genou. La consolidation fut longue a obtenir, le membre due être immobilisé pendant 4 mois.

Cet aspect gélatinéforme des épanchements tuberculeux est très rare. Je l'ai observé cependant dans un cas de péritonite tuberculeuse chez une jeune fille. Dans la région iliaque gauche et dans l'hypochondre il y avait une masse gelatineuse et dans le reste de l'abdomen il y avait des granulations tuberculeuse sur tout le péritoine.

On sait que pour quelques auteurs, la tuberculose des bourses séreuses

préarticulaires se présente parfois sous cet aspect gélatineux et bien des kystes du creux poplite seraient de nature tuberculeuse.

Zwie besondere Formen von tuberkulöser Arthropathie des Kniees.—(MAUCLAIRE.)

Ich habe hier zwei anatomische Varietäten gesehen, in der ersten ist eine, Reiskörper enthaltende Effusion; in der zweiten eine gelatinöse Effusion.

(*a*) Arthritis mit Reiskörpern war beobachtet worden bei einer jungen 29 Jahre alten Frau, von sehr starker Konstitution, mit keinen Zeichen von Lungentuberkulose. Die Krankheit begann im Januar, 1907, und drei Monate später untersuchte ich die Patientin. Sie zeigte alle Zeichen einer Hydrarthrosis, aber auf Druck wurde die charakterische Crepitation hervorgerufen. Ich nahm eine externe Arthrotomie vor, welcher Entleerung der Effusion und antiseptische Reinigung folgte. Die Patientin erholte sich rasch und trug eine Kniekappe. Sie besitzt einen sehr lebhaften Beruf, welcher sie veranlasst, sehr viel zu gehen. Ich habe sie alle drei Monate gesehen, und heute, fünfzehn Monate nach der Operation, ist keine örtliche Zurückkehr, noch ein Auftreten von Tuberkulose in irgend einem anderen Teile des Körpers aufgetreten.

Es ist wahr, dass ähnliche Fälle nicht selten sind. Der interessante Punkt an meinem Fälle ist die Abwesenheit unangenehmer postoperativer Wirkungen und die Beständigkeit der Heilung, da die meisten Fälle von Arthritis von Reiskörpern eine Tendenz zu fungöser Synovitis zeigen. Der Fall ist daher einer von verringerter tuberkulöser Arthritis.

(*b*) Arthritis mit gelatinöser Effusion des Kniees, war bei einer jungen, 32 Jahre alten Frau beobachtet worden. Die Symptome waren jene einer typischen weissen Geschwulst, nachdem die Incision für eine Resection gemacht worden war, war ich überrascht in dem Gelenke eine beinahe reichliche gelatinöse Effusion vorzufinden. Die Gelenksflächen selbst waren sehr wenig angegriffen. Es waren einige fungöse Veränderungen im Gelenke vorhanden, und eine tuberkulöse Osteitis der Patella.

Ich nahm eine Resection des Kniees vor. Die Verbindung war unterbrochen, und das Glied hatte durch vier Monate hindurch unbeweglich zu sein.

Dieser gelatinöse Anblick tuberkulöser Effusion ist sehr ungewöhnlich. Nichtsdestoweniger beobachtete ich ihn in einem Falle von tuberkulöser Peritonitis bei einem jungen Mädchen. In der linken Darmbeingegend und im Hypochondrium war eine gelatinöse Masse und im übrigen Teil des Abdomens waren tuberkulöse Granulationen über das ganze Peritoneum verstreut.

Nach einigen Autoren offenbart Tuberkulose der Gelenkschleimbeutel diese gelatinöse Erscheinung. Und viele Cysten des Kniegelenkes und namentlich der Regio poplitea werden als tuberkulos angesehen.

Two Special Forms of Tuberculous Arthropathy of the Knee.—(MAUCLAIRE.)

I have seen here two anatomical varieties. In the first there is an effusion containing rice bodies, in the second, a gelatinous effusion.

(*a*) Arthritis with rice bodies was observed in a young woman twenty-nine years old, of very strong constitution, with no trace of pulmonary tuberculosis. The illness began in January, 1907, and I examined the patient three months later. She showed all the signs of a hydrarthrosis, but with pressure the characteristic crepitation was elicited. I performed external arthrotomy followed by evacuation of the effusion and antiseptic cleansing. The patient recovered rapidly and wore a knee-cap. She resumed a very active profession, which obliges her to walk a great deal. I see her every three months, and to-day, fifteen months after the operation, there is no local recurrence nor trace of tuberculosis in any other part of the body.

It is true that similar cases are not rare. The interesting points about my case are the absence of unpleasant postoperative effects and the permanence of the cure, most cases of arthritis with rice bodies showing a tendency to fungous synovitis. The case is, therefore, one of attenuated tuberculous arthritis.

(*b*) Arthritis with gelatinous effusion of the knee was observed in a young woman thirty-two years old. The symptoms were those of a typical white swelling. After making the incision for a resection, I was surprised to find in the joint a rather abundant gelatinous effusion. The articular surfaces themselves were but little injured. There were some fungous changes in the joint and a tuberculous osteitis of the patella.

I did a resection of the knee. Union was delayed and the limb had to be immobilized for four months.

This gelatinous aspect of tuberculous effusions is very unusual. Nevertheless, I observed it in a case of tuberculous peritonitis in a young girl. In the left iliac region and hypochondrium there was a gelatinous mass, and in the rest of the abdomen tuberculous granulations scattered over the entire peritoneum.

According to some writers, tuberculosis of the prearticular serous bursæ presents this gelatinous aspect, and many cysts of the popliteal space are regarded as tuberculous.

IMMOBILIZATION IN TUBERCULOUS ARTHRITIS.

By Dr. A. Codivilla,
Bologna.

In the treatment of tuberculosis of the joints, as in that of spondylitis, the difference in opinion among surgeons consists more in the details than in the essentials of the treatment. They all agree in admitting that our intervention acts indirectly, even when it is operative, and that the healing of the process is due to the good organic powers of resistance against the local affection. Therefore, surgeons try to remove all those conditions, both local and general, which tend to lower the vitality of the organism, and to procure those which may strengthen it in the struggle; for instance, hygienic conditions, sea air, immobility of the affected parts, iodic cure, hyperemia (Bier), emptying of abscesses, endoarticular and para-articular (sclerogenic) injections. Thus it is evident that the surgeon's aim is to assist nature in the normal process of cure of the local tuberculosis. But the same thing must be admitted when the surgeon operates, because, with the exception of certain cases, he only removes a part of the infected tissues, and then leaves the task of definite conquest to nature.

It is not to be wondered at, therefore, if surgeons have interested themselves recently in finding means of helping the natural process of cure, rather than excogitating new operative processes aiming at a complete extirpation of the infected region.

At this time the prevailing method of treatment of tuberculosis of the joints has conservative tendencies, inasmuch as surgical intervention is resorted to only in cases of exceptional gravity, and this applies to all the articulations, with the reservation, however, that for some of these, under more favorable anatomical conditions, *i. e.*, knee, elbow, hinge-joint, the field of operation is more extensive than in others. The rule, however, remains the same, because it is only a question of limiting the boundaries. The few who hold aloof from this rule—Kocher, for example, who advocates premature intervention, even in coxitis—have no followers, because the extirpation of an initial osseous focus, which has already given rise to an endoarticular process, leaves behind it the diffused alteration of the articulation and conditions hardly different from those preceding the operation, or even aggravated by the injury resulting therefrom. To this, we must add that experience has

taught us that the cure obtained by conservative means leaves better functional conditions.

On the contrary (and this may be inferred from what I have said), operative intervention is absolutely indicated if the osseous focus is para-articular, and the articulation is still healthy. The extirpation of this removes the probability of the process eventually extending to the joint. I do not intend to treat this subject to its fullest extent. My opinion on the importance and limits of the two methods, preservation or destruction, is not different from that recently expressed by the surgeons at the different congresses, and, especially, at that of the Surgical International Society, at which many of my views were expressed in a report. I only desire to call attention to the importance of a perfect immobilization of the affected part, which is, in my opinion, the greatest factor in the cure. If this does not meet the views of every one, I am inclined to attribute it to the fact that immobilization is often applied with poor judgment and defective technic. The opponents of the method insist, also, upon the harm which immobilization causes in producing atrophy of the tissues and articular rigidity. To this method, however, alterations have been attributed which are, on the contrary, direct consequences of the tuberculous process itself. The atrophy of the bones and the atrophy and functional impotence of the muscles manifest themselves early in tuberculous arthritis, also, when the part is not made immovable, and agree with a greater virulence of the phlogosis. The rigidity of the articulation is due to the transformation of the diseased tissues during the period of reparation. Immobilization in itself only produces modifications in the tissues, which adapt themselves to the new functional state of the part which has been rendered immovable; and the harm which it produces is easily corrected after the removal of the apparatus. Immobilization is responsible for only a small part of the articular rigidity which is noticeable after the cure; and, as it assists the healing of tuberculous phlogosis, it has a beneficial influence, also, on the motor function of the articulation. There can be no doubt of the truth of this statement when we remember that an articulation in a state of contracture offers much less passive resistance to straightening after a period of immobility than before. As I shall relate further on, I use immobilization to facilitate the straightening of the contractures in tuberculous arthritis.

As to the injury which the apparatus itself may cause, we must consider, on the other hand, the apparatus which, in the treatment of spondylitis, render the whole body immovable. These undoubtedly hinder the development of the chest and the relative visceral functions, and we ought to remember this and give it its proper weight in the balance with the pernicious effect on the process if the affected region were not rendered immovable. In the greater number of cases, and during the period when the process

maintains an invading action, this latter turns the balance and immobilization is indicated.

Let us now pass on to the rules which must be applied to this method of treatment. First of all, immobilization must be adopted at the first signs of infection, in order that its beneficial effects may manifest themselves more clearly. Therefore, an early diagnosis is very necessary. I think that, for this purpose, we should avail ourselves of every means of verifying our suspicions of the signs of incipient tuberculosis of the joints, and that radiographic examinations and tests with tuberculin should be adopted oftener by the practitioner.

To the rule of applying immobilization as soon as possible must be added that of making it as complete as possible for the entire period during which the phlogosis gives certain signs of its presence. The pain, fever, and tumefaction must have disappeared before we should think of permitting certain movements of the joints; the passage from immobilization to liberty of the articulation should be gradual, and, by degrees, the part will pass from a state of rigidity to one of flexibility. In this period importance must be attached to the slightest signs of a reawakening of the process, and a return made to the application of continued immobilization.

It is very difficult to decide upon the right moment for the entire or partial removal of the apparatus, and, for the most part, the eye and common sense of the practitioner must judge when the first attempts at liberation of the affected part can be made. No standard rule can be given as to the time required; in some fortunate cases one or two months are sufficient, while in the greater number one or more years are necessary.

At the same time nothing very definite can be said as to the moment when we may pass from an absolute to a relative immobilization or when the apparatus can be removed and the weight of the body allowed to bear upon the part. By means of an example I shall show what my own personal experience has taught me. In the so-called florid period of coxitis,—*i. e.*, when the process is evidently progressing,—after a period of observation, which the patient passes in bed, extended by weights, I render the affected part immovable by means of a plaster apparatus furnished with Kappeler's stirrups, to which the limb in extension is adjusted. It almost always happens that some time after this the tendency of the phlogosis to take a stronger footing ceases, and the affection enters an apparently stationary period. On removing the apparatus it is observable that the acuteness of the symptoms has passed and that some slight passive movement of the joint is possible without pain. On the application of extension by weight, the night will pass without contractions or characteristic cries. If, in such a case, radiography does not show an increase of the atrophy which existed before the treatment was begun, I judge that the right moment has arrived for the

extension to be removed. I then apply a plaster apparatus, which includes also the foot, but without traction. I usually leave this apparatus for three or four months, and, on its removal, if the improvement in the local conditions has continued, and if the nutrition of the bone is also good, I apply a new apparatus, which only comes down to the malleolus, leaving the foot free. Thus the weight of the body bears upon the injured part, and this without causing any harm if the radiographic shade of the bones is dense, and if the articular lines are regular.

I differ here from Lorenz, who considers it preferable for the hip to bear the weight of the body. In experiments made at Instituto Rizzoli on two series of patients in almost the same conditions, and treated, one with the apparatus permitting the pressure of the joint, and the other without the pressure, the results were more satisfactory in the latter case. The cases in which the joint had suffered from the action of the weight of the body in all the phases of the illness presented shortening, and the radiograph showed a cuneiform deformity of the head, and a corresponding excavation of the acetabulum. The pressure had favored the compressive ulceration.

After another period of some months the apparatus is again removed, and, according to the successive improvement of the local conditions, and after a sufficient number of days (passed by the patient in bed with extension by weights, massage of the leg, and exercises of the knee-joint) have brought the conditions of these parts to such a point that we need not fear any change in the circulation of the leg, or irritation of the knee, when once they are set at liberty, a new plaster apparatus, reaching as far as the femoral condyles, renders the hip immovable. However well modeled the apparatus may be, it does not prevent slight rotary movements of the femur on its own longitudinal axis, and the joint, too, is charged with the weight of the body.

After a further period of immobilization this apparatus also is removed, and, if the conditions are favorable, it may be substituted by a similar one of leather, which can be taken off at will, to permit of massage and any movements that may be deemed necessary.

The example explains the gradual passage from the cessation of the articular function to its reacquirement, first by making the weight of the body act upon the joint, then by slight rotary movements of the femur, and lastly, and by degrees, all the other movements.

The local conditions of the case sometimes require special and repeated dressing or small operations, such as the puncture of abscesses, incisions, etc. The necessity for such intervention may also arise during the immobilization treatment. An increased accumulation of exudate in the cavity of the joint, the infiltration of this into the surrounding spaces, the share which the periarticular soft parts take in the process, the formation of abscesses which often necessitate these small interventions in the spontaneous evolution of

the morbid process, form stages which may often be regarded as favorable rather than otherwise.

In order that the cure may not be interfered with, we must try to prevent the pyogens from invading the focus, and must maintain the immovability. This, too, is a help to the prevention of a mixed infection. With immobilization and a free use of antiseptics, I am not disturbed by an opening in the cavity large enough to permit of the rapid emptying of the residual products of the inflammation. In this way a rapid spontaneous closing of the abscess almost always takes place, or there only remains a fistulous sinus, discharging only a few drops of pus, which, by a long and narrow canal, opposes sufficient resistance to air to prevent an increase of infection, and almost always ends by closing. I empty abscesses by puncture only when they are small and deep.

The therapeutic applications to which I have alluded are not unfavorable to immobilization, because the apparatus can be made with openings, or it can leave the surrounding region free by joining the two parts by means of metal bands; in some cases the joint can be rendered immovable by simple extension.

Naturally, we cannot combine immobilization with movements or interventions which aim at remedying positions of contracture or deformities which we find necessary to remove in order to benefit the functions of the limb. However, these interventions ought to be used so as to interfere as little as possible with the effects of the treatment of the deformities. I will remind you that the traumatism must be very slight if the straightening is gradual, and provided that we try, in the first place, to conquer the resistance of the soft parts, and after that to modify the formation of the skeleton. Extension and eventually tenotomies and aponeurotomies, etc., will serve to extend the soft parts which occupy the angle of the deformity. When these resistances are overcome, the corrective endoarticular modifications will be obtained without employing any particular force, and, consequently, without the development of strong pressure between the heads of the joints, and with minimum trauma. The extension, which must precede the correction, can be secured in the usual manner, by traction on the distal segment of the contractured joint. A strong fixation of the proximate segment during the distention may be necessary sometimes, and, for the hip, a plaster apparatus is excellent, as it includes the pelvis, the opposite thigh, and the lower half of the trunk, and renders the movements of the lumbar column less easy. When once the extension has acted for the necessary time, the fixture of the proximate part renders the corrective manipulations more secure, and facilitates the result. In some cases I close the two segments of the contractured joint in a plaster apparatus, divide this circularly at the spot corresponding to the angle of

the contracture, and open the distending force on the two parts, completing the apparatus after the correction. This is often obtained by degrees after different periods of an application of drawing power, followed by corrective exercises and immobilization, with the completion of the apparatus. In both these cases, and in those in which it is not advisable to correct the deformity, in the periods which precede the complete correction I facilitate walking or render it possible by inserting in the proper place in the apparatus a rigid stick, which, like a pillar, allows the proximate segment of the limb—or of the pelvis, if the hip is in question—to maintain the normal position. The patient walks on the artificial limb and so leaves the injured part in repose.

And now, two words about the means which are used for the immobilization of the injured joint. They are two: the extension of the joint and the apparatus which inclose it. Extension acts by opposing to the muscles a resistance which either hinders or renders their contraction difficult, rather than by a real discharge of the injured joint; so we eliminate the danger that the reflex or voluntary contractions of the muscles with the movements, and the increase of pressure which they cause in the joint, may give rise to traumatic damage to the injured parts and favor the extension of the morbid process. On the contrary, the apparatus tries to control the segments of the skeleton which form the joint, and to adjust them in such a manner as to prevent the possibility of any movement. This is absolutely impossible in practice, because the soft parts which cover the skeleton prevent the apparatus from taking a sufficient hold on the bones, and some movement of the joint is possible. Thus, the immobilization will be more secure if the two methods are used together, *i. e.*, apparatus and extension. This is indicated more for those joints with short bony segments, on which it is less easy for the apparatus to get a hold. In the hip, for instance, it is difficult for the apparatus to get a sufficient hold on the pelvis, and the joint is dominated by very strong muscles; therefore, especially for the hip, we must often use the two methods together. The extending force can act in a continuous and uniform manner, as in the application of weights or in elastic traction, which we must be careful to maintain quite equally or it may lose its strength little by little as the resistance diminishes. If the apparatus is complete, and if the extremity of the joint is fixed in Kappeler's stirrup, thus including in the apparatus itself the force of extension which acted during the construction of the apparatus, we put the second method of extension into practice. When, after having conquered the resistance, we wish to make use of extension again, we must divide the apparatus into two parts, corresponding to the locality on which the force must act; and, after the application of this force, complete the apparatus in the hollow remaining between the two disjoined parts. The two forms of extension have special

indications. Something about this has already been said when I spoke of the correction of the positions of contracture. We use the force in a continuous and uniform manner when we wish to combat the state of permanent muscular contraction which, partly voluntary and partly reflex, accompanies the florid period of the illness. In this period, too, in order that the immobilization and the action of the force may have the best results, it is better for the patient to remain in bed. This also permits a continual observation of the affected part, which will give indications of the best manner of conducting the treatment.

As I have given you to understand in several parts of my lecture, when there are indications of immobilization in an apparatus, which happens at the end of the period of observation, I always have recourse to the immovable plaster apparatus, which is the most secure in the holding and immobilization of the part, the most easily made, and the cheapest. The plaster apparatus answers all purposes if its application has not erred in conception and technic. In conception it must give—(*a*) a perfect fixation, and, therefore, must come up to the segments which are above the injured articulations far enough to afford sufficient hold, and must also fix the skeleton by means of deep modeling on its most exposed parts and on those which adapt themselves as points of support to the apparatus: (*b*) slight extension.

In regard to the technic of its construction, this, which has been notably improved recently, permits us to make light plaster apparatus which hold the skeleton and can also exercise strong extending force without injury to the soft parts, and which last a long time.

The apparatus called "ortopedici" never give a perfect immobilization, and I only use them as a precautionary measure in the period which follows recovery. The immobilization treatment, applied in the above described way, is, according to my experience, the best coefficient to healing tuberculous joints and spondylitis; and, for the most part, when it is applied as soon as the morbid process declares itself, it is enough in itself, to effect a cure in a comparatively short time. It is a method of treatment within the reach of every one, and, for this reason, merits the widest circulation.

La Importancia de la Inmovilizacion en la Artritis Tuberculosa.— (CODIVILLA.)

El parecer del Dr. Codivilla, esta de acuerdo con la opinion del cuerpo de cirujanos de varios Congresos Internacionales, de que el tratamiento de la artritis deberá ser conservativo solamente, puesto que la operacion quita una parte del tejido afectado, mas deja la otra parte ya infiltrada de la afeccion. De esto hay excepciones. La inmovilizacion perfecta (las objeciones á esta son debidas á descuidos en el tecnisismo ya la aplicacion

irracional) es la gran ayuda en la cura. Atrofia, y rigidez de la articulacion es debido al proceso tuberculoso, puestoo que esto ocurre tambien aun cuando la parte no esta inmovilizada. La fijacion produce solamente una pequeña parte de la rigidez, y será de gran ventaja en el uso posterior de la articulacion, es indicada por el hecho de que la articulacion en un estado de contraccion ofrese menos resistencia al enderezarla despues de un periodo de inmovilizacion que antes. Moldes de la pasta de Paris en casos de espondilitis, son perjudiciales, por que estos interfieren con el desarrollo del pecho, etc., mas en gran parte de los casos, y durante el proceso de la invasion, estas objeciones desaparecen á causa de las ventajas del proceso local por medio de la inmovilizacion. Esta medida deberá adoptarse en los primeros signos de la lesion; por lo tanto los signos iniciales deberan ser estudiados; los resultados del examen por los rayos X, son mas frecuentemente confirmados por medio de las inyecciones de tuberculina. La inmovilizacion deberá ser completa durante el periodo de los sintomas de la inflamacion y el movimiento de la parte ejercitado gradualmente. No se pueden dar reglas sobre este punto.

El método del Dr. Codivilla en la coxitis, es el llamado estado "florido," guardar al paciente en la cama con pesas solamente durante un periodo de observacion. La parte es entonces inmovilizada por medio de un molde, y con un estribo de Kappelers para continuar la traccion. Cuando los sintomas agudos han desaparecido completamente, la traccion se quita, y mas tarde un nuevo molde es aplicado dejando el pie libre, y permitiendo el peso del cuerpo, esto es cuando las sombras de la radiografia son densas y las lineas de la articulacion son regulares. Despues de un periodo regular de tiempo, se quita el molde de nuevo y el paciente es guardado por algun tiempo considerable en la cama con extension, y mientras tanto masage, ejercicios ligeros de la rodilla deberan emplearse para guardar el equilibrio de la circulacion del miembo. Despues se aplica un nuevo molde se aplica a los condiles del femur. Esto previene movimiento con la excepcion del de rotacion, y la articulacion ahora soporta el peso. Finalmente se aplica un aparato de cuero, de tal modo que el massage y la mocion pasiva puedan aplicarse.

Incision ó abertura de los abscesos no interfieren con la inmovilizacion. La formacion de pequeños abscesos pueden ser favorables. Una infeccion mixté deberé evitarse por medio de la antisepcia. Abertura puede hacerse en el molde.

A fin de evitar las contracciones y las deformidades, el Dr. Codivilla recomienda evitar el tromatismo en tanto cuanto sea posible. Deberá vencerse primero la resistencia de los tejidos. Traccion, eurotomia y oponeurotomia pueden ser requeridas. Despues la modificacion de la deformidad endoarticular no necesitara fuerza.

El Dr. Codivilla describe su metodo por medio de la aplicacion del molde en estos casos.

El valor de la inmovilizacion de la articulacion, es notablemente aumentada por medio del empleo de uno de los metodos de traccion, puesto que esto evita los movimientos voluntarios y reflejos de los musculos, lo cual daria por consecuencia poner los huesos en contacto con la articulacion, y de este modo producir un tromatismo. Durante el estado "florido" esta fuerza deberá ser continua.

La inmovilizacion (por medio de un extenso y bien aplicado molde), combinado con la traccion, segun la experiencia del Dr. Codivilla, es el mejor metodo en la cura de la spondilitis tuberculosa y la tuberculosis de las articulaciones.

Importance de l'immobilisation dans l'arthrite tuberculeuse.—(CODIVILLA.)

L'auteur dit que le traitement de l'arthrite tuberculeuse doit être conservateur, puisque l'opération ne fait qu'éloigner un foyer de la maladie de l'os et laisse l'articulation infiltrée. Il y a des exceptions. L'immobilisation parfaite (les objections contre cette méthode sont dûes à des fautes dans la technique et à une application non rationnelle) est la meilleure aide dans le traitement. L'auteur attribue l'atrophie et la rigidité articulaire au procès tuberculeux, car elles ont lieu même quand le membre n'est pas immobilisé. Pour démontrer que la fixation ne produit qu'une petite partie de la rigidité et qu'elle est avantageuse parce que, finalement, elle augmente la possibilité de faire usage de l'articulation, l'auteur dit qu'une articulation contractée offre, après un temps d'immobilité, beaucoup moins de résistance au redressement, qu'avant ce temps d'immobilité. L'emploi du plâtre dans la spondylite empêche, il est vrai, le développement de la poitrine etc., mais dans la plupart des cas, et pendant le procès d'invasion, ces objections sont compensées par les avantages de l'immobilisation pour la lésion locale.

On doit adopter cette mesure dès les premiers signes de la lésion. On doit, par conséquent, étudier les signes initiaux, employer les rayons X et tâcher de faire confirmer le diagnostic par les injections de tuberculine, L'immobilisation doit être stricte pendant la période des symptômes inflammatoires et on ne doit commencer par la mobilité que vers la fin du traitement et la faire graduellement. On ne peut donner de règle exacte pour cela.

La méthode pour la coxite, dans la phase appelée "florissante," consiste à tenir le malade au lit, n'employant que des poids, pendant un temps d'observation. Ensuite, l'articulation est rendue immobile par un bandage en plâtre avec des étriers de Kappeler, pour continuer la traction antérieure.

Quand les symptômes aigus disparaissent tout à fait, on éloigne l'instrument de traction et, plus tard, on applique un nouveau plâtre, qui laisse le pied libre, à condition que l'ombre radiographique de la partie lésée soit épaisse et que les lignes articulaires soient régulières. Après quelque temps ce plâtre est enlevé de nouveau et on garde le malade au lit, avec un instrument d'extension, pendant un temps variable, selon le cas; pendant ce temps on fait des massages à la jambe et des mouvements passifs au genou, pour activer la circulation. Ensuite, on applique un nouveau plâtre qui atteint les condyles du fémur, ce qui ne permet qu'un seul mouvement de l'articulation malade, la rotation, et, maintenant, la jointure porte le poids du corps. Enfin, un appareil en cuir qu'on puisse ajuster, peut être substitué, de sorte qu'on puisse faire des massages et des mouvements passifs.

Les incisions ou les ponctions d'abscès n'empêchent pas l'immobilisation. La formation de petits abscès peut être favorable. Une infection mixte doit être évitée par l'antisepsie. On peut faire des ouvertures dans le plâtre.

Dans le traitement des contractures et des difformités, il faut qu'il y ait le moins de traumatisme possible. On doit d'abord vaincre la résistance des parties molles. On peut avoir besion de faire des tractions, des névrotomies et des aponévrotomies. La modification des difformités endoarticulaires ne demandera l'emploi d'aucune force particulière.

Méthode de l'auteur, de la traction au moyen d'un plâtre, employée dans ces cas.

La valeur de l'immobilisation de l'articulation par le plâtre est beaucoup accrûe par l'emploi d'une des méthodes de traction, parce que par là les contractions musculaires volontaires et réflexes, qui ont pour conséquence l'attouchement des os de l'articulation, n'ont pas lieu et ainsi, la cause du traumatisme dans la partie lésée, disparait. Dans la phase "florissante," la traction doit être continuelle.

L'immobilisation (produite par des plâtres étendus et bien modelés) combinée avec la traction est, la meilleure méthode pour guérir la tuberculose des articulations et la spondylite.

Die Wichtigkeit der Unbeweglichkeit bei tuberkulöser Arthritis.—(CODIVILLA.)

Dr. Codivillas Ansichten sind in Übereinstimmung mit jenen, die durch die Chirurgen bei den verschiedenen internationalen Kongressen ausgedrückt wurden, dass die Behandlung der tuberkulösen Arthritis konservativ sein soll, seitdem operative Massnahmen nur einen Herd der Knochenerkrankung entfernen und das Gelenk infiltriert lassen. Dazu gehören einige

Ausnahmen. Vollständige Unbeweglichkeit (die Einwendungen dagegen sind auf nachlässige Technik und unrationelle Anwendung zurückzuführen) ist die grösste Hilfe, um Heilung zu erzielen. Atrophie und Gelenksteifheit schreibt er dem tuberkulösen Prozesse zu, seitdem sie vorkommen, wenn der Teil nicht unbeweglich gemacht wurde. Dass Fixation nur sehr wenig Unbeweglichkeit hervorruft, and von Vorteil sein wird, um zuletzt die Gebrauchsfähigkeit des Gelenkes zu steigern, ist durch die Tatsache bewiesen, dass eine Articulation in einem Stadium der Kontraktion viel weniger Widerstand einer Stärkung gegenüber leistet, nach einer Periode der Unbeweglichkeit, als früher. Gipsverbände für Spondylitis sind schädlich, da sie die Entwickelung des Brustkorbes verhindern, etc., aber in der grösseren Zahl der Fälle und während der Prozess sich entwickelt, sind diese Einwendungen überwogen durch die Vorzüge dem lokalen Prozesse gegenüber durch Unbeweglichkeit.

Die Massnahmen müssen bei den ersten Anzeichen einer Verletzung vorgenommen werden. Deshalb sollten die anfänglichen Zeichen studiert werden, *x*-Strahlen angewendet, und die Diagnose häufiger durch Tuberkulin Injektionen bestätigt werden. Die Unbeweglichkeit sollte durch aus während der Zeitdauer entzündlicher Prozesse vollständig sein, und Bewegung schliesslich sehr langsam eingeführt werden. Es kann dafür keine Regel aufgestellt werden.

Er beschreibt seine Zugmethode durch Anwendung von Gipsverbänden in diesen Fällen.

Der Wert der Unbeweglichmachung des Gelenkes mit Gipsverband wird sehr unterstützt durch die Anwendung einer der Zugmethoden, weil die willkürliche und reflektorische Muskelkontraktion die Knochen des Gelenkes zusammenbringen, und derartig ein Trauma in dem erkrankten Teile hervorrufen würde. In dem "floriden" Stadium sollte dies fortgesetzt werden.

Unbeweglichkeit (hervorgerufen durch Zug verursachende und gut modellierte Verbände) in Verbindung mit Zug ist nach Dr. Codivillas Erfahrung die beste Methode für die Heilung tuberkulöser Gelenke und von Spondylitis.

DE L'OBLITÉRATION DES CAVITÉS OSSEUSES ET ARTICULAIRES TUBERCULEUSES AVEC LA PÂTE DE MOSETIG.

Par Nové-Josserand,
Professeur il l'Université, de Lyon.

Nous avons fait quelques tentatives d'oblitération des cavités consécutives à l'évidement de foyers tuberculeux osseux, ou à des résections articulaires avec le mélange de Mosetig composé de: iodoforme 60, blanc de baleine 40, huile de sésame 40.

La technique employée a été la suivante: les lésions tuberculeuses diaphysaires ou juxta-épiphysaires étaient évidées avec la curette ou le couteau-gouge, de façon à enlever non seulement les tissus malades mais aussi tous les tissus douteux. On extirpait aussi aux ciseaux ou à la curette les masses fongueuses développées autour de l'os et la membrane pyogénique des abcès froids. Ensuite, la cavité était soigneusement asséchée, et stérilisée par l'air chaud. Alors on coulait à son intérieur le mélange iodoformé, après l'avoir ramolli en la portant à une température de 55°.

Dans les arthrites tuberculeuses, la résection a toujours été faite suivant la méthode d'Ollier, c'est à dire sous capsulo-périostée. Après avoir abrasé les surfaces articulaires, on évidait les foyers tuberculeux qui se trouvaient dans les épiphyses, on excisait la synoviale en conservant la capsule fibreuse de l'articulation, on évidait aussi les masses fongeuses périarticulaires et les abcès froids, puis après hémostase soigneuse on remplissait tout l'espace vide avec le mélange plastique.

Nous avons appliqué cette méthode dans 16 cas d'ostéite tuberculeuse se décomposant ainsi: un cas d'ostéite de l'humérus chez un nourrisson, avec extension à la moelle dans toute sa longeur; un cas d'ostéite juxta-épiphysaire inférieure de l'humérus avec cavité du volume d'un petit oeuf, drainée sans résultat depuis 10 mois: un petit foyer sous périostique de la diaphyse du cubitus; deux ostéites juxta-épiphysaires du tibia; onze cas enfin de spina ventosa des métacarpiens des métatarsiens ou des phalanges.

La réunion par première intention a été obtenu 7 fois, et dans tous ces cas la guérison se maintient. Les 9 autres malades ont eu de la désunion de leur plaie et une élimination partielle du mélange. La plus grande partie

de celui-ci est néanmoins réstée en place dans le plus grand nombre des cas, et tous ont guéri dans un laps de temps de quinze jours à trois mois.

Plusieurs fois, on a pu suivre par la radiographie la résorption du mélange. Celle-ci se fait plus ou moins vite suivant les dimensions de la cavité; elle demande en général de un à cinq mois.

Nous comptions également 10 cas de résection articulaire: une résection de l'extrémité supérieure du radius; une du poignet; deux de la hanche; une du genou; deux ablations de l'astragale, dont une avec évidement du calcanéum; une ablation du calcanéum; une tarsectomie antérieure et une tarsectomie totale avec ablation de tous les métatarsiens.

La réunion immédiate fur obtenue dans le cas de résection, de l'extrémité supérieure du radius. Dans la résection du poignet, les deux astragalectomies, et la tarsectomie partielle, la réunion ne fut pas tout à fait complète, il y eut quelques fistulettes, notamment au niveau du drain; néanmoins la guérison fut à peu près complète au bout d'un mois. Dans le cas d'ablation de l'astragale le mélange fut éliminé en totalité, mais la plaie se réunit ensuite rapidement. Enfin dans les résections de la hanche, du genou, et dans la tarsectomie totale, il se fit de la suppuration avec élimination partielle du mélange. Nous avons cependant l'impression que chez ces malades, les suites opératoires ont été plus simples que dans les autres cas traités par le drainage seul, et que la guérison a été plus rapide.

Ces faites sont en somme assez semblables à ceux qui ont été rapportés par Mosetig lui même; ils s'en différencient cependant sur deux points. C'est d'abord que toutes ces interventions ont eté faites pour des lésions assez avancées. après essai souvent prolongé des moyens conservateurs ordinaires. Mosetig, au contraire est partisan d'intervenir de bonne heure dès que le diagnostic de la nature tuberculeuse est posé. Nous voulons faire remarquer en second lieu, que dans tous les cas, nous avons fait un simple évidement très complet et non pas la large exérèse que recommandait Mosetig. De même dans les rèsections, nous avons toujours conservé la capsule articulaire, en faisant seulement un dissection soigneuse de la synoviale. Nos observations montrent que l'on peut obtenir des résultats satisfaisants avec des opérations assez économiques pour ne rien compromettre de la fonction ultérieure du membre.

Le mélange de Mosetig parait agir à la façon d'un pansement interne très antiseptique, qui, tantot se résorbe, tantot s'élimine par les fistules. Dans un cas comme dans l'autre, il protège les bourgeons réparateurs de la plaie contre l'infection secondaire, il les excite à rendre leur maximum d'effet, Ainsi le traitement est abrégé la suppuration diminuée ou supprimée, les malades sont plus vite en état de reprendre leur vie normale, et la guérison parait aussi plus définitive.

Obliteration von tuberkulösen Knochen- und Gelenkshöhlen durch die Mosetig Paste.—(Nové-Josserand.)

Dr. Nové-Josserand berichtet 16 Fälle von tuberkulöser Knochenentzündung und 10 Fälle von tuberkulöser Gelenksentzündung, behandelt durch Ausleerung und Resektion, und nachher mit Einspritzung von Mosetig's Iodoform-Gemenge. Unmittelbare Heilung wurde in 7 Fällen von Knochenentzündung erlangt, und in einem Falle von Arthritis. In den meisten andern Fällen erfolgte vollständige Wiederherstellung in ungefähr einem Monat. Längere Eiterung wurde nur in 2 Fällen von Resektion der Hüfte und in einer Resektion des Kniees beobachtet.

Das Interesse dieser Beobachtungen liegt in der Tatsache, dass die zufriedenstellenden Erfolge erhalten wurden durch achtsame Entleerung der Höhlen ohne die von Mosetig empfohlene extensive Auskratzung, und bei den Resektionen mit Erhaltung der Gelenkkapseln.

Die Methode der Obliteration mit dem Iodoform-Gemenge lässt sich deshalb leicht mit konservativen Operationen vereinigen, und gefährdet nicht die Funktionsleistung des ergriffenen Teiles.

Obliteration of Tuberculous Bony and Articular Cavities with Mosetig Paste.—(Nové-Josserand.)

Dr. Nové-Josserand reports 16 cases of tuberculous osteitis and 10 cases of tuberculous arthritis treated by evacuation or resection, followed by the injection of Mosetig's iodoformized mixture. Immediate union was obtained in 7 cases of osteitis and in 1 case of arthritis. In most of the remaining cases complete recovery ensued in about a month. Prolonged suppuration was observed in only 2 cases of resection of the hip and in 1 resection of the knee.

The interest of these observations lies in the fact that these satisfactory results were obtained by careful evacuations of the lesions without the extensive scraping recommended by Mosetig, and, in the case of resections, with preservation of the articular capsule. The method of obliteration with the iodoformized mixture is therefore compatible with conservative operations and does not jeopardize the ultimate functional integrity of the part.

Obliteración de las Cavidades delos Huesos y de la Tuberculosis Articular por Medio de la Pasta de Mosetig.—(Nové-Josserand.)

Dr. Nové-Josserand presenta diez y seis casos de ostitis tuberculosa y diez casos de artritis tuberculosa tratados por medio de la evacuacion ó

resección, seguida por la injección de una mistura de yodoformo y la pasta de Mosetig. Unión inmediata fue obtenida en 7 casos de ostitis y en 1 caso de artritis. En la mayor parte de los casos restantes una recuperación completa fue obtenida en casi de un mes. Supuración prolongada se observó solamente en 2 casos de resección de la articulación de la cadera y en 1 de resección de la rodilla.

El interés de estas observaciones consiste en el hecho de que resultados satisfactorios fueron obtenidos por medio de una evacuación cuidadosa de la lesion sin recurir á la raspadura extensa recomendada por Mosetig, y en el caso de reseccion, con preservación de la cápsula de la articulacion. El método de obliteración con esta mistura es por lo tanto compatible con la operación conservativa sin afectar la integridad funcional de la parte.

THE VALUE OF THE ROENTGEN METHOD IN THE EARLY RECOGNITION OF TUBERCULOSIS OF BONES AND JOINTS.

By Carl Beck, M.D.,

Professor of Surgery in the New York Postgraduate Medical School and Hospital.

The Roentgen method, in reflecting the various anatomical changes in the tissues, enables us frequently to recognize a tuberculous focus at a stage in which our clinical methods failed, thus making early and conservative therapy possible. The changes are not only proportionate to the different intensity and extent of the tuberculous process, however, but are also dependent upon the texture of the various bones. It is well, therefore, to consider that the predilection of the disease is for the epiphyses of the long bones and the diaphyses of the short, like the metacarpus and metatarsus, the small spongy bones, like the carpus, tarsus, and vertebræ, while flat bones, like the skull and scapula, are seldom the seat of the process. Only the ribs are to be excepted. The visible changes begin when the bacillus, after invading the bone substance through the circulation as a bacterial embolus, affects the blood-vessels, and in multiplying produces a number of nodules, which gradually destroy the medullary tissues; in other words, the medium of nutrition of the bone. The trabeculæ become absorbed, and a granulating focus, largely composed of tubercles, takes their place. Such foci may be of a circumscribed character, may form in one bone only or in several at the same time, or multiple foci may establish themselves in one and the same bone. Where there is a strong tendency to diffusion and decay, the changes show the cheesy character, the tissues becoming more and more infiltrated, as is especially observed at the diaphysis of the short bones of the metatarsus, the metacarpus, and the digits. There a circumscribed focus seldom establishes itself, the whole diaphysis, as a rule, becoming a sequestrum. A circumscribed focus, confining itself to the center of the bone, may remain there for a long time in temporary innocence, no clinical evidence of it manifesting itself until some irritation sets up an inflammatory process, which is followed by further spreading of the tuberculous process. Then the surface of the bones may be reached, and the proliferation of the periosteum there produces new bone, while in the deeper region the old bone is absorbed. This process finds conspicuous exterior expression

in the spindle-shaped enlargement of the bone-circumference. The homologue of this combination of gradual destruction and construction is the osteomyelitis of the phalanges, ordinarily called spina ventosa. The same macroscopical impression prevails when the process of destruction confines itself to the cortex, while the center of the diaphysis still shows healthy zones. Roentgen examination gives the most marked expression of these anatomical changes. If, in the circumscribed form of tuberculous osteomyelitis, as described above, the trabeculæ are gradually absorbed, granulations taking the place of the osseous tissue, the metamorphosed area appears translucent. The more extensive the changed area, the greater the absorption of calcareous matter, consequently the greater the translucency of the affected sphere. The formation of caseous substance alters this condition but little. The cortex appears to be more or less distended. In long bones there is little periosteal proliferation, while in short bones it is abundant.

As soon as a circumscribed focus perforates the cortex, its formerly regular shadow becomes interrupted, and some of the portions appear confluent.

In the infiltrating type of tuberculous osteomyelitis osteoporosis is found. Some of the osseous tissue is absorbed, just as in the circumscribed type, but most of it becomes necrotic by the inhibition of nutrition. The skiagraphic expression of this process is, therefore, entirely different from that in the circumscribed foci. Sequestra appear as dark shadows, the absence of textural details characterizing them as dead bone tissue.

The Roentgen method not only diagnosticates the presence of a focus—it also localizes it and outlines its extent so well that the steps of an operation can be definitely traced in advance, the skiagraph serving as a mentor before and during the operation.

Intraosseous foci are found at the periphery as well as in the middle. They may be globular, elliptic, or tubular. If tubular, the focus may permeate the whole epiphysis, and joint perforation may take place. If this occurs in the hip-joint, further perforation may take place into the retroperitoneal space, and a subphrenic abscess may finally form. If there be, as described above, a disturbance of nutrition, an area of necrosis may form, which in most instances assumes the shape of a triangle, the base of which will be near the joint surface. This phenomenon is explained by the arrangement of the nutrient vessels, which diverge from the medulla toward the cartilaginous surface, so that just the area supplied by these vessels will become necrotic if the nutrition is inhibited. Thus a cuneiform sequestrum is formed. It may, however, also be of a more rhomboid character in proportion to the different shape of the articular ends of the various bones. The color of the necrotic bone portion is white at the beginning, as the medulla and Haversian canals are interwoven with pus-cells and cheesy tubercles.

In the further course of the exfoliation process a thin granulation stratum forms as the only means of coherence between the sequestrum and the healthy tissue. The clinical symptoms may be slight in such cases, because the development of the process is slow, and pain as well as functional disturbance may be insignificant. But the skiagraph shows the contrast between the dead and the healthy area convincingly.

Articular tuberculosis is more frequent than the osseous type, and represents, in fact, the most predominant joint disease. The insidious character, especially the slow development of this variety, makes an early diagnosis without the aid of the Roentgen method impossible in most cases. As is well known, at first either the synovial membrane or the osseous epiphyses become involved, the synovialis, as a rule, being attacked first. In the latter the process may be circumscribed or diffuse. The circumscribed type is rare, and confines itself mostly to the fibrous portions of the synovial membrane, where it forms hard nodules which may vary between the size of a filbert to that of a walnut. They consist of young connective tissue, which partially shows signs of fatty degeneration. Decayed tubercles are interspersed. The diffuse type, on the other hand, shows the synovial membrane thickened and reddened, its solid surface being covered with fibrinous exudation. This hyperplastic variety generally leads to the formation of a serous effusion in the joint (tuberculous hydrops). The fibrin may deposit itself also in the recesses of the joint, where it may become organized. The membrane becomes thickened; at the deeper edges organized fibrin proliferates and covers the cartilage, which is finally invaded and macerated. Thus the cartilage becomes thinner, and finally appears sieve shaped at some portions. In the further course the destruction may become so extensive that only small remnants of the cartilage are found at some areas, while the larger portion of the joint surface is occupied by newly formed tissue. The ligaments, as well as the parasynovial tissues, share the same fate. They swell and become softened, so that with the surrounding connective tissue they appear like soft jelly. This swelling, which is in strong contrast to the atrophy of the non-infected part of the extremity, gives the joint the well-known spindle shape. The granulating type shows vague symptoms at the beginning; later there is uniform thickening of the joint, serous effusion, and muscular contraction. In this stage, of course, the clinical symptoms indicate the disease. At the early era no focus exists which could be skiagraphed, but there is the irregular thickening of the synovial membrane, which finds its skiagraphic expression in the irregular joint line which, at the same time, appears diffused, cloudy, and often shaggy. In the fibrous form the shadows are darker. If the process of destruction reaches the cartilage, its erosion is indicated by its saw-like appearance. If the cortex is reached, the skiagraphic impression is left as if a piece had been bitten out.

The invasion of the periarticular tissue finds its skiagraphic expression in the irregular dark shadows which prevail in contrast to the light shadows that point to the absorption of calcareous matter as a consequence of the inflammatory reaction. This phenomenon is found, to a greater or lesser extent, in all cases of bone- or joint tuberculosis, some areas showing it more marked than others, according to the greater or lesser intensity of the process at the various affected zones. If there is hydrops, the joint gap becomes enlarged in proportion to the amount of distention of the joint. One condyle becomes hypertrophied, sometimes both. Later, when there is no surgical interference, indentation of the joint-line, as described above, supervenes.

With the exception of the hip-joint, these skiagraphic points apply to all joints. The special anatomical peculiarities of the hip, of course, cause special skiagraphic expressions. Under normal circumstances a regular semicircular arc, as the expression of healthy cartilage, is constantly found between the femoral head and the acetabulum, while in case of tuberculosis the articular outlines become slightly irregular and diffuse, sometimes even translucent. Later, stalactite-shaped projections are often found as the expression of fungous destructions around the ruins of bone. Of course, when the destruction has advanced so far that the head becomes severed, the remnant of the femoral neck being displaced upward, the diagnosis can be well made without the Roentgen method. But in modern times the process of destruction should not be permitted to go as far.

Now, how are these skiagraphic points to be utilized in a therapeutic sense? I may say that in the type of tuberculosis which we recognize as the osseous, exposure and *evidement* is the main treatment, while synovial tuberculosis is amenable to more conservative therapy. The treatment par excellence in these cases is the intra-articular injection of iodoform glycerin. It is a surprising fact that, in spite of the miraculous results reported by a number of trustworthy surgeons, this method has not become popular. Some claim that they tried in vain and gave it up therefore, but on more thorough inquiry it was found that the failures were due to its injudicious use, especially in the osseous type or in cases which were advanced too far. Particularly when fistulæ had formed, when there is periarticular destruction, the affected area should be widely opened and the diseased synovials and the cheesy and necrotic foci extirpated. No injection treatment should be tried then. It is also in such cases that the Roentgen method furnishes a reliable guide during the operation as to the location and the number of the foci and also the presence of necrotic fragments.

TREATMENT OF HIP-JOINT DISEASE.

By Professor F. Calot,
Berck sur Mer, France.

The history of the treatment of coxitis includes three epochs: (1) That in which abscesses were opened and drained—and the patient died. (2) That in which such tubercular abscesses were aspirated and, if they healed, it was always with deformity and impaired function. (3) The present one, consisting in the early intra-articular injections of modifying liquids, followed by cure, complete and rapid, with no lameness.

The shortening of the leg, consecutive to the ordinary treatment, is due to the erosion and destruction of the articular bone surfaces, under the tubercular process. The usual therapy is unable to prevent such disgraceful results, even in the case of cure. Through a very long experience I was led to try a treatment preventive of such destruction of the articular surfaces; and such a preventive is found in the early injection of a mixture composed of: Creosote, 3 parts; iodoform, 7 parts; ether, 25 parts; olive oil, 50 parts.

Draw a horizontal line passing by the spines of the tubes, and locate the femoral artery. Then insert a long and thin needle (of the spinal puncture type) at a point 2 centimeters outside of the artery and 3 centimeters below the horizontal line. At 4 or 5 centimeters deep the point of the needle comes in contact with the anterior surface of the neck of the femur. Put the thigh in slight flexion, abduction, outward rotation. Such injections to be repeated every three to five days,—9 or 10 in number,—and covering a space of some two months. Quantity of liquid: 4 to 10 c.c., according to age. All this time the patient must be in bed—either with extension or in a plaster cast. The cast must be made bivalve, in order to be removed.

When the injection period is over, continued extension is still kept up, or the plaster cast, for a second period of three months, after which four to five months are spent in bed, with no extension or plaster cast, before patient is allowed to get up. The patient will then be cured. Time and experience have long ago proved my propositions. The cure will be effected with no shortening or impairment of functions, and in a much shorter time than under earlier methods.

SECTION III.

Surgery and Orthopedics (*Continued*).

FOURTH DAY.

Thursday, October 1, 1908.

TUBERCULOSIS OF THE GENITO-URINARY TRACT, INTESTINES, AND PERITONEUM.

The Section was called to order by the President, Dr. Charles H. Mayo, at half-past nine o'clock.

TUBERCULOSIS OF THE VAS, EPIDIDYMIS, AND TESTIS.

By John B. Walker, M.D.,
New York.

Tuberculosis of the testis is not recognized as a common disease, although it occurs more frequently than is generally appreciated, and its ultimate fatal termination is due to this lack of recognition of it in its earliest stages. It is of the greatest importance and consideration to the individual that it be recognized in its very earliest stages, for otherwise, if not thoroughly treated, it is generally progressive in its destruction of first one testicle, and later of the remaining testicle. Then the ascending process involves successively the vesiculæ seminales, prostate, bladder, or kidney, and terminates in death.

Heredity.—Heredity is not of much importance as a causative agent, as very few patients give any family history of tuberculosis. It may act as a predisposing cause in those patients who have inherited a condition of lowered vitality in which there is a tendency to the development of tuberculosis. It may also have some influence in those cases developing in infancy.

Etiology.—Age: It is rare in infancy, being observed only occasionally in large children's clinics. However, Julien reports 16 cases seen in children, among whom it occurred in 6 patients under one year of age. The largest number of patients are seen in early adult life, between the ages of twenty and thirty, when the sexual organs are most active. Keyes states that 65 per cent. occurred between the ages of fifteen and thirty-four. Tuberculosis of the genital system occurs usually as a primary disease of the epididymis, and is not generally associated with pulmonary tuberculosis. In the majority of cases tuberculosis of the epididymis develops before there is any evidence of tuberculosis elsewhere. Keyes states that among 100 cases where the histories were examined by him he found 49 cases without any evidence of previous tuberculosis elsewhere, and 36 cases who had suffered from tuberculosis elsewhere—in the lungs, bones and joints, glands, kidneys, etc. Haas, in his 111 cases, found 26 per cent. affected with tuberculosis of other organs. Various observers lay different degrees of stress upon gonorrhea as a causative agent in developing the tuberculous epididymitis. Koenig believes it responsible in 30 per cent., while Haas states that it occurred in only 5 per cent. of his cases. There is evidence to show that gonorrhea may light up a latent tuberculous focus which had been dormant for years. Trauma is held to be of importance as an exciting cause in a considerable number of cases. The injury may have been slight and forgotten at first, but later the patient recalls it at a subsequent examination.

The tubercle bacilli enter the system most frequently through the respiratory tract or the gastro-intestinal tract. Bugge claims that in 75 per cent. of all persons dying from all causes there are found tubercle bacilli present in the mediastinal or mesenteric glands. From the glands the tubercle bacilli enter the circulation. Saltzman affirms that the "bacilli contained in the blood localize in the epididymis at some point where there exists a focus of diminished resistance, congenital or produced by previous injury or disease. The frequent localization in the epididymis is accounted for by the fact that the spermatic artery divides opposite that organ, and that the vessels of the epididymis are smaller and more tortuous than those of the vas or testicle proper, the current therefore being slower." Guyon, after a careful study of the histories of 222 cases and 42 autopsies, concluded that there existed a primary urinary tuberculosis as well as a primary genital tuberculosis, but that the genital organs were primarily most commonly affected, and that the infection most often ascended from the genital tract to the urinary tract. Koenig, Kocher, and other careful observers have maintained that in the majority of cases the testicular affection is preceded by tubercular disease higher up in the genito-urinary tract, especially in the vesiculæ seminales and prostate.

A descending infection is not considered as frequent a path of invasion as through the blood-vessels; but, of course, it is possible as the tubercular process displays a tendency to spread along the natural passages either up or down, and to induce a total affection of the apparatus involved. In order to substantiate the theory of a descending infection, Delli Santi, in his experiments on dogs, produced a tuberculous epididymitis by injecting tubercle bacilli into the urethra. It was necessary to produce a pathological condition by ligating the spermatic veins, excluding the vas and producing a venous stasis in the organ. The control animals not injured did not develop tuberculosis. Tubercle bacilli were found also in the testis, but the testis was not affected, because the natural resistance of the tissues prevented the growth of the germs. Von Baumgarten, working to demonstrate the theory of an ascending infection, was unable in his experiments to produce tuberculosis of the vas when the tubercle bacilli were injected into the prostatic urethra or prostate, but if injected into the testis, tuberculosis of the vas regularly followed; whereupon von Baumgarten concluded that the tubercle bacilli do not travel against the stream of blood or lymph secretion. Von Baumgarten found tuberculosis limited in six instances to the vas adjoining the epididymis, and this was corroborated by microscopical serial sections which showed the intensity of tuberculosis diminishing as the sections progressed toward the prostate. Finally, the fact that diffuse tuberculosis of the vas is more common than the disseminated is also favorable to the teaching of ascending tuberculosis; and where disseminated tuberculosis existed, those nodes nearer the prostate were not in as advanced a state of degeneration, and clinically, too, there was an appreciable diminution in the size of the fusiform nodules from the testis to the prostate. "Whereas the earlier observers regarded tuberculosis of the epididymis a resultant of descending tuberculosis, the weight of foremost pathologists, Virchow, Rokitansky, Weigert, aver that vas deferens tuberculosis is secondary to tuberculosis of the epididymis. The earlier wrong belief has its origin in post-mortems conducted on advanced cases, who succumbed to their tuberculosis; the incipient cases were not studied. Von Bruns (Haas), from the study of 111 cases operated upon, has no doubt that in the great majority of cases epididymis tuberculosis preceded disease of the vas deferens. Acceptance of this overwhelming proof as to the mode of dissemination of tuberculosis of the vas is responsible for very high excision." Undoubtedly one can have a descending infection, yet most observers believe that this disease is usually an ascending infection, the epididymis being affected primarily and the bladder, prostate, etc., secondarily, the process extending upward along the surface of the mucous membrane of the excretory duct.

Reynier favors the view of primary involvement of the epididymis,

claiming that early examination will demonstrate it. A patient dying of a fracture of the skull showed at autopsy early tuberculosis of the epididymis and no other localization. In three other cases of tuberculosis of the epididymis, after careful examination, no other lesion was found. Tillaux reports a similar case of tuberculosis of the epididymis cured by vasectomy. Dimitresco (1897), after a careful study of the literature, concluded that "the disease may begin primarily in the prostate, vesiculæ seminales, or the epididymis, the latter being the method in an immense majority of cases. The testis is always healthy at first, except in rare instances. Young says, 'it seems to me sufficiently proved that primary tuberculosis of the epididymis occurs, and probably is the most common initial lesion,' though it cannot be denied that involvement of the epididymis often occurs secondary to disease of the vesiculæ seminales and prostate, as it does less frequently after tuberculosis of the lungs and of the urinary tract."

As there is marked divergence of opinion as to the location of the primary focus, so there is also great diversity of opinion as to the method of extension. This disease most often occurs first in the right testis. The infection begins in the globus minor, extends to the globus major, and later involves the testis. In the early stages one or more small nodules may be found in globus minor or major; "later other nodules form in different parts, which enlarge and coalesce, converting the epididymis into a hard, irregularly shaped mass, which still later, after caseation and softening have taken place, may be soft and fluctuating." As the disease progresses the testis becomes involved, and later it begins to ascend and infect first the vas, not throughout its entire length, but at various points irregularly located; but not until it is extensively diseased do the vesiculæ seminales become infected. After this the prostate becomes somewhat involved; following this the opposite testis becomes diseased in a majority of the cases, this extension being due to the flow of the infectious material up the diseased vas to the prostatic urethra and down the opposite vas to the epididymis on the same side.

Symptoms.—Usually the onset is very gradual, the first symptom appearing insidiously and progressing slowly. If the patient be debilitated or if a mixed infection exists, the onset may be sudden and the course rapid and violent. The course is generally slower in children than in adults, the parents first noticing a slight swelling of the epididymis, which is not especially painful. In the adult there occurs usually a feeling of weight and discomfort in the testis, which first becomes tender rather than painful on pressure. A nodule at the lower part of the epididymis is then accidentally found on examination. After a short time a dull aching pain develops in the testis, which is aggravated by exercise, but which often disappears entirely when the patient is resting. Later this pain may become dull,

heavy, aching, and extend up the cord to the groin or even be felt in the back. The nodule becomes larger as it extends up the epididymis, then it involves the testis, and later extends upward along the vas, the progress being slow or rapid according to the condition of the patient. Frequently at first there are no general constitutional symptoms unless there be tuberculous deposits in some other organ. The urethral discharge which is generally present is due to the irritating action of the tuberculous products which are discharged into the prostatic urethra. It may be whitish and mucoid or bloody and purulent. As the disease advances it produces more or less vesical irritation. At first there is merely a slight frequency of urination; later tenesmus develops. If the urine be examined, it will be found to contain a small amount of pus, blood, and mucus. Careful search for tubercle bacilli must always be made and great care must be used to differentiate it from the smegma bacilli.

In many cases the vesiculæ seminales become involved and are found to be soft and swollen and somewhat painful on pressure. "Later nodules develop and become of irregular shape and are hard and painful on pressure." If the prostate becomes involved, it is somewhat difficult to detect it in the early stages, inasmuch as the tuberculous deposit occurs deep in the substance of the prostate; at first it is swollen and tender, but later hard and nodular. As the disease advances the nodules in the epididymis enlarge, coalesce, and soften, and later the pus burrows into the adjacent tissues, the scrotal skin becomes adherent, bluish, and finally the abscess opens spontaneously without much pain. One or more sinuses are formed which show no tendency to close.

A hydrocele is almost always found when the testis becomes involved. Careful examination will also frequently reveal the presence of tuberculous lesions in other parts of the body—either former foci or present active disease. Unless the local lesion be easily removed, the opposite testicle sooner or later becomes involved in a large majority of all cases. Haas states that "simultaneous involvement of both testes is rare, only about 3 per cent., but that in 38 per cent. the opposite testis became involved."

Diagnosis.—Epididymitis due to tuberculosis may often be confused with that due to gonorrhea or syphilis, and with neoplasm. If due to tuberculosis, one may frequently discover a history of recurrent attacks, or may find traces of other tuberculous foci, enlarged cervical glands in childhood, or see the scars of former abscess formation, osteomyelitis, hip- or knee-joint trouble. Familiarity with clinical aspects of tuberculosis will also help. In a majority of cases there is present a hydrocele which obscures the free and perfect examination, so this must be aspirated before the epididymis becomes distinct enough to feel. The tuberculin test may also be made use of. Tubercle bacilli may also be found in the urine or in

pus massaged from the prostate or vesiculæ seminales. The nodules are at first isolated and independent of each other and not confluent, and are of peculiar hardness. They also extend up the vas, which becomes thickened and nodular; this thickening of the vas is absent in gonorrhea or syphilis. Vesical irritation is present in tuberculosis, but not present in syphilis. When it is due to syphilis, it is influenced by antisyphilitic remedies and disappears under treatment. In syphilis are found specific lesions elsewhere, which also yield to treatment. In syphilis no tubercle bacilli are found in the urine. Sinuses are generally present in tuberculosis, but not in gonorrhea or syphilis.

Prognosis.—This varies with the extent and severity of the disease, and depends greatly upon the method of treatment employed. In some cases the disease remains local for a long period, and may ultimately cure itself by caseation and cicatrization. Usually the disease slowly extends from the epididymis, and finally involves the prostate, vesiculæ seminales, and bladder, so that the prognosis is unfavorable when the disease is left untreated. "Whether the affection of the vesiculæ seminales or prostate supersedes or follows the testicular disease or not, the clinical fact remains the same. The removal of the testis and epididymis causes in a large percentage of the cases a complete subsidence of vesical or prostatic symptoms and healing of tubercular process in these parts." "If the epididymis which is primarily affected be removed early, it is probable that the other testis will not become involved." In children the prognosis is usually good if palliative treatment be employed.

Treatment.—The treatment may be palliative or radical. In infancy tuberculous disease of the testis and epididymis exhibits a tendency to encapsulation and cure, so that no radical operation is indicated. Constitutional and hygienic remedies should be employed. The testis should be supported and the child should rest as much as possible. If an abscess forms, it should be early incised and curetted. In the adult, when the diagnosis is definite, it is wiser not to delay, but to proceed with either epididymectomy or orchidectomy. General hygienic and constitutional treatment is, of course, not to be neglected, but to be combined with operative procedure. Incision and curettage must be considered merely as palliative measures, and are usually followed by prolonged suppuration, with extension of the disease and ultimate destruction of the testis. Excision of the vas, as recommended by Mauclaire, is not sufficiently radical. Finocchiaro has recently reported some excellent cases treated after Duranti's method with local injections of iodin. He states that the inflamed epididymis rapidly subsided in size and became transformed into indolent fibroid tissue. The iodin stimulates the tissues to increased resistance and phagocytosis, while it attenuates the virulence of the bacteria. The iodin treatment restores

to society men, not eunuchs. Sufficient time has not yet elapsed to recommend this as a radical treatment. Avulsion, as advised by von Büngner, has been followed by too many accidents to permit it to be recommended above epididymectomy. The extent of the disease must determine which operation is to be followed. In all cases of tuberculosis of the epididymis which are recognized early, epididymectomy is the operation of choice. It was first employed in 1850 by Jarjavay. Since then various representative surgeons have used and advised it. It has constantly gained in favor as a conservative operation.

Operation.—An anatomical dissection is made, which is easy, and very little cutting is necessary, except in dividing the vasa deferentia where they enter the globus major. "An incision is made into the sac of the tunica vaginalis just external and parallel to the epididymis." A dissection is made of the epididymis from the testis proper, commencing below at the globus minor and passing upward to the mediastinum testis. From here one proceeds slowly and carefully, so as not to injure the spermatic arteries and veins, closely hugging the epididymis and separating it from the testis proper and the spermatic vessels. Blunt dissection is best employed. When the globus major is free, the vas is to be isolated from the other structures of the cord upward as far as the internal ring; it is clamped and divided and cauterized with 95 per cent. carbolic acid; the needle is worked upward in the lumen half an inch; when the cauterization is complete, the vas is ligated with chromic one-quarter of an inch from the end, and the tunica albuginea is sutured with catgut. The testis is replaced in the sac (scrotal). The external ring is closed with catgut and with a drain. The drain is removed in forty-eight hours. Epididymectomy should be performed in all cases of localized tuberculosis of the epididymis, and also in those cases where only small areas of the testis are involved. It is a radical method because it removes the diseased tissues, and an economic procedure because it preserves the testis. It becomes feasible because the patient will consent to an early epididymectomy, but will not consent to, but postpones until too late, the operation of castration. Every one to-day acknowledges the great necessity of preserving the testis, because of its great importance in supplying the internal secretion which is so necessary for the body economy and nervous equilibrium. After epididymectomy the testis does not atrophy; the power of fecundation is lost, but the desire for and the power of coitus are preserved. An examination of the literature, with the reports of more than 200 cases, by such competent observers as Keyes, Young, Haynes, Murphy, Berger, Petit, Rovsing, Duranti, Lauenstein, Bardenheuer, and others, proves beyond doubt that epididymectomy is preferable to orchidectomy, except as when contraindicated by extensive disease of the testis. Orchidectomy should be limited to those cases of

extensive disease of the testis. In examining the pathological reports of numerous specimens after castration, it has been found that the glandular portion of the testis was not involved; therefore in these cases orchidectomy was not indicated. Furthermore, sexual power has been lost.

Results.—After epididymectomy and orchidectomy in many cases the symptoms of vesical and prostatic irritation subside. Reclus states that the majority of cases of tuberculosis of the testis are accompanied by foci in the prostate and seminal vesicles, and that these patients get well after orchidectomy. Their recovery is due probably to the fact that the constant stream of virulent products from the diseased epididymis is stopped and the irritation of the prostate and adjacent structures ceases. The most convincing statistics are those of Koenig. In 45 carefully examined cases the prostate or seminal vesicles were involved 17 times, with disease of one testicle, and 14 times with both testicles. Of the 17 cases, 14 were followed over two years with 10 complete cures, 1 improvement, and 1 death. Of the 14 cases, 9 were cured, 2 improved, and 2 died. In all the fatal cases the lungs or urinary tract were involved before the operation. "It is therefore well established that tuberculosis of the prostate and vesiculæ seminales not only does not contraindicate operation, but in the majority of instances will disappear after the operation. This seems to follow the partial operation (epididymectomy) as well as castration" (Young).

Conclusions.—Castration has not been followed by the brilliant results expected after so radical an operation. It should be limited to those cases where only one testis is extensively diseased, but it is especially objectionable when both testes are involved.

Epididymectomy is preferable to castration in the usual form of tuberculosis of the testis. Cure follows in the majority of cases. Inasmuch as it can be performed under cocain anesthesia, it is not contraindicated when there is involvement of the lungs or the kidneys. After epididymectomy the testes frequently preserve their normal macroscopical appearance.

BLASENTUBERKULOSE.

Von Dr. Med. Wilhelm Karo,
Berlin.

Indem ich für die ehrenvolle Einladung unseres verehrten Herrn Vorsitzenden, Ihnen ein Referat über Blasentuberkulose zu erstatten, verbindlichst danke, bemerke ich, dass ich bei der Kürze der mir zugemessenen Zeit Ihnen nur in grossen Zügen meine klinischen Erfahrungen ohne Berücksichtigung der von anderen Autoren publizierten Anschauungen vortragen kann. Die Basis meiner Ausführungen bildet das grosse Material der Casper'schen Klinik in Berlin, an der ich in den letzen 7 Jahren über 100 Fälle von Urogenitaltuberkulose zu beobachten Gelegenheit hatte. Wir betrachten die Tuberkulose der Harnblase als Teilerscheinung, resp. als ein Symptom einer tuberkulösen Infektion des Urogenitalsystems. Hielt man früher allgemein die Urogenitaltuberkulose für einen aufsteigenden Prozess, und galt demgemäss die tuberkulöse Blase und noch mehr die Nierentuberkulose als eine unheilbare Krankheit, so lehren uns unsere chirurgischen Erfolge, dass die Blase fast stets descendierend von der auf hämatogenem Wege primär erkrankten Niere aus infiziert wird; in seltenen Fällen mag die Blasentuberkulose durch Übergreifen eines primär in den Genitalorganen lokalisierten Herdes entstanden sein.

Die Frage, ob es überhaupt eine primäre Blasentuberkulose ohne Beteiligung der Nieren gibt, lässt sich klinisch ohne Autopsie in vivo kaum entscheiden. Da, wie wir durch das Studium der Nierentuberkulose gelernt haben, trotz klaren, eiweissfreien Harns eine Tuberkulose in einer Niere zu bestehen vermag, wird uns selbst der doppelseitige Ureterenkatheterismus nur bedingten Aufschluss geben können. Indessen hat uns das Ureterencystoskop darüber belehrt, dass fast in allen Fällen von tuberkulöser Pyurie der Eiter bereits aus den Nieren kommt, dass es also Blasentuberkulose ohne Beteiligung der Nieren kaum je gibt. So befinden sich unter unserem grossen Material lediglich zwei Fälle, in denen der einzige erkennbare Tuberkelbazillenherd die Blase war; beide betrafen Frauen, in beiden Fällen wurde durch doppelseitigen Ureterenkatheterismus aus beiden Nieren klarer albumenfreier Harn ohne körperliche Bestandteile entleert. Da wir aber wie eben ausgeführt, hieraus noch nicht auf Intaktheit der Nieren schliessen dürfen, muss ich die Frage, ob auch in diesen beiden Fällen die Tuber-

kulose nicht etwa ursprünglich in der Niere begonnen, und erst sekundär die Blase ergriffen habe, unentschieden lassen. Massgebend für unsere Frage wären nur solche Fälle, in denen bei klarem Harn auch die modernen functionellen Untersuchungsmethoden die Intaktheit der Nieren bewiesen hätten. Die eben angeführten Fälle—sie liegen bereits 5 Jahre zurück—wurden functionell nicht untersucht. Daher möchte ich auf Grund meiner langjährigen Erfahrungen betonen, dass ich keinen einzigen Fall kenne, in dem der absolut zwingende Beweis für das Vorkommen einer primären isolierten Blasentuberkulose erbracht ist.

Pathologisch-anatomisch unterscheiden wir zwischen der eigentlichen Blasentuberkulose, die bekanntlich mit der Genese und Entwickelung des miliaren Tuberkels gleichen Schritt hält, und der tuberkulösen Cystitis. Vom klinischen Standpunkt aus hat die Lokalisation dieser Veränderungen ein grosses Interesse; denn namentlich in frischen Fällen gibt sie uns einen Aufschluss über den Infektionsweg, also beispielsweise bei einer deszendierenden Tuberkulose der rechten Niere findet man in der Regel in der Umgebung des rechten Ureters die charakteristischen Veränderungen. Dass auch hier Ausnahmen vorkommen, soll weiter unten ausgeführt werden. Je länger die Krankheit besteht, um so mehr verwischt sich die ursprüngliche Lokalisation, desto weitere Partien der Blase werden von der Krankheit ergriffen.

Was nun die Symptome der Blasentuberkulose anbelangt, so brauchen dieselben nicht nennenswert verschieden zu sein von den auch bei anderen Formen der Cystitis landläufigen, also Dysurie in den mannigfachsten Abstufungen, Pyurie und Hämaturie. Es kann nicht scharf genug betont werden, dass jedes einzelne dieser Symptome, sofern es von mehr als vorübergehender Erscheinung ist, uns an Tuberkulose der Harnwege denken lassen muss. Es hat sich als verhängnisvoller Irrtum herausgestellt, sich durch die kräftige Konstitution des Kranken, durch sein blühendes Aussehen, durch Körpergewichtszunahme täuschen zu lassen, und in solchen Fällen die Harnveränderung als Symptom einer einfachen Cystitis anzusehen. Als Illustration hierzu ein Fall:

Ein 56-jähriger Mann erkrankte ein Jahr bevor er in unsere Behandlung trat, an einer Gonorrhoë, die unter der üblichen Behandlung allmählich mit Hinterlassung eines als chronische Cystitis gedeuteten Symptomenkomplexes ausheilte. Patient musste häufig urinieren; der Harn blieb trotz ständiger Blasenspülungen eitrig, die Beschwerden wurden von Monat zu Monat schlimmer, ohne dass Patient bis auf den lästigen quälenden Harndrang—er musste schliesslich alle 20 Minuten Urin lassen—den Eindruck eines Schwerkranken machte. Als er in unsere Behandlung trat, war er bei bestem Allgemeinbefinden. Cystoskopisch fanden wir den linken Teil der Blase stark ulceriert, den linken Ureter zerklüftet, in seiner Umgebung bullöses Oedem; den rechten Teil der Blase vollkommen

gesund, den rechten Ureter klein, mit glatten Rändern. Der Ureterenkatheterismus ergab links eitrigen Urin mit Tuberkelbazillen, rechts klaren Harn ohne körperliche Bestandteile. Die linke Niere wurde entfernt; wir fanden eine grosse tuberkulöse Caverne in ihr. Patient erholte sich sehr rasch. Bereits zwei Wochen nach der Operation hörten ohne weitere lokale Behandlung die Tenesmen auf; nach 4 Wochen war der Urin vollkommen klar. Ich habe den Patienten noch kurz vor meiner Abreise vor wenigen Wochen wieder gesehen. Er hat seit der vor 4 Jahren vorgenommenen Operation 20 Pfund zugenommen; sein Harn ist auch heute noch absolut klar; die Blase cystoskopisch vollkommen ausgeheilt.

Ich habe Ihnen den Fall lediglich als eine Illustration zu meiner Behauptung angeführt, dass man sich nicht durch den guten Allgemeinzustand des Kranken über die wirkliche Ursache seiner Beschwerden täuschen lassen soll. Vielmehr müssen wir in allen Fällen von Pyurie an Tuberkulose der Urogenitalorgane denken und nach Tuberkelbazillen fahnden. Wir haben gefunden, dass man bei genügender Geduld in mehr als 90 % der Fälle schon im einfach gefärbten Präparat die Bazillen nachweisen kann. Zweckmässigerweise zentrifugiert man den Bodensatz der ganzen 24-stündigen Harnmenge. Eine Verwechselung mit Smegma-Bazillen darf einem geübten Untersucher nicht passieren; beide Arten unterscheiden sich durch ihre Form, wie namentlich auch durch die Lagerung im Präparat. Finden wir keine Bazillen, dann müssen wir das Tierexperiment anstellen und zwar bedienen wir uns zweckmässigerweise des nach Bloch modifizierten Verfahrens, das uns bereits nach etwa 10 bis 14 Tagen zum Ziele führt. Der Sicherheit halber impfen wir gleichzeitig ein zweites Meerschweinchen ohne Quetschung der Drüsen nach Bloch. Der negative Ausfall des Tierexperiments ist noch kein zwingender Beweis für die nicht-tuberkulöse Natur des Leidens. Wir müssen in solchen Fällen mit der Möglichkeit einer sogenannten geschlossenen tuberkulösen Pyonephrose denken, das sind Fälle von einseitiger Nierentuberkulose mit Obliteration des kranken Ureters, der aus der Blase entleerte Harn stammt nur aus der gesunden Niere. Wie dem auch sei, mag man Bazillen gefunden haben oder nicht, stets ist es unsere Pflicht, in jedem Fall von Verdacht auf Tuberkulose der Harnwege durch das Cystoskop unsere Diagnose zu verfeinern. Ich scheue mich nicht, die Unterlassung der Cystoskopie in solchen Fällen als einen groben, verhängnisvollen Kunstfehler zu bezeichnen, muss aber gleich hinzufügen, dass diese Untersuchungen nur mit peinlichster Gewissenhaftigkeit, mit der grössten Zartheit vorgenommen werden dürfen, weil sie, von ungeschickter Hand ausgeführt, oft von bedenklichen Folgen begleitet sein können. Prinzipiell empfiehlt sich vor jeder Cystoskopie, die Blase mittels Novokain oder Alypin eventuell in Verbindung mit Adrenalin gründlich zu anästhesieren, weil wir auf diese Weise die gerade bei Tuberkulose so charakteristische Schmerzhaftigkeit ausschalten, und dadurch die Blase besser zu

entfalten vermögen. In sehr vorgeschrittenen Fällen von tuberkulöser Schrumpfblase ist es oft zunächst nicht möglich, die Blase zur Cystoskopie genügend auszudehnen. In solchen Fällen müssen die Patienten mit Dauerkatheter und schwachen Sublimatspülungen eventuell mit Tuberkulin einige Wochen vorbehandelt werden, dann gelingt es fast stets, unter lokaler, resp. unter Rückenmarksanästhesie eine Cystoskopie auszuführen. Es genügen uns schon 50 bis 60 c.c. Blaseninhalt.

Was sehen wir nun mit dem Cystoskop? Gemäss der Pathogenese der Blasentuberkulose sehen wir an den Ureteren in ihrer Form und Intensität wechselnde Veränderungen von einfachen eitrigen Auflagerungen und Rötungen bis zu schweren ulcerösen Zerklüftungen. Dazu gesellt sich meistens ein mehr oder minder diffuses bullöses Oedem, das oft die Uretermündung überlagert. Je weiter vorgeschritten der Fall, desto grössere Teile des Trigonums schwellen samtartig an und ulcerieren. Die vordere, resp. obere Wand der Blase bleibt meistens verschont. Ebenso ist der Sphincter internus kaum je von dem Krankheitsprozess ergriffen, also ein weiterer Beweis gegen die Theorie von der aufsteigenden Tuberkulose. Unter den vielen hunderten von Cystoskopien, die wir in Fällen von Urogenitaltuberkulose vorgenommen haben, fanden wir nur ein einziges Mal eine hochgradige Infiltration des Blasenhalses. Gleichzeitig bestand in diesem Falle eine so hochgradige Schrumpfung des Trigonums, dass beide Ureterenöffnungen dicht an einander gerückt waren, so dass man sie in einem Gesichtsfelde des Cystoskops beobachten konnte. Der Befund von grauen Knötchen von scheinbaren miliaren Tuberkeln in der Umgebung der Ureterpapille bei sonst gesunder Blase ist für Tuberkulose nicht beweisend. Wir haben an unsere Klinik solche Fälle beobachtet und uns selbst täuschen lassen. So diagnostizierten wir bei einem 35-jährigen Geistlichen, der seit ca. einem Jahre an einer unmotivierten Pyurie litt, der sehr heruntergekommen war, auf Grund des cystoskopischen Bildes—man fand um den rechten Ureter typische graue Knötchen—eine Tuberkulose der rechten Niere. Die Operation ergab eine Steinniere, doch keine Tuberkulose. Weiterhin ist gesundes Aussehen eines Ureterostiums und seiner Umgebung kein Beweis für die Intaktheit der betreffenden Niere; es wäre für den Kranken sehr verhängnis würden wir auf Grund solcher Befunde unsere therapeuvoll, tischen Entschliessungen treffen. Dafür ein belehrendes Beispiel:

Bei der Cystoskopie eines jungen Mädchens, das uns mit den Schulsymptomen einer Tuberkulose der Harnwege konsultierte, fanden wir eine Auflockerung und Schwellung des linken Ureters. In seiner Umgebung einige unbedeutende Ulcerationen; der rechte Ureter war intakt, der rechte Teil der Blase gesund. Wir glaubten also auf Grund des cystoskopischen Bildes eine Tuberkulose der linken Niere anzunehmen, hielten die rechte Niere für gesund, und den Fall dementsprechend für operabel. Der doppel-

seitige Ureterenkatheterismus ergab indessen zu unserer grössten Überraschung, dass auch die rechte Niere eitrigen bazillenhaltigen Harn entleerte, ja in ihrer Funktion so schwer geschädigt war, dass wir den Fall als inoperabel entlassen mussten.

Ähnliche Fälle sind uns auch in der Folgezeit gelegentlich begegnet. Daraus ergibt sich für uns die absolute Notwendigkeit, in jedem Falle von Tuberkulose der Harnwege unbedingt den doppelseitigen Ureterenkatheterismus behufs genauer Diagnose auszuführen. Ja, noch mehr! Um auch bei klarem Harn von beiden Seiten vor Irrtümern geschützt zu sein, müssen wir die modernen funktionellen Untersuchungsmethoden zu Rate ziehen; dieselben sind namentlich auch dann von ausschlaggebender Bedeutung, wenn beide Nieren eitrigen Harn sezernieren.

Wenn wir auf diese Weise rechtzeitig jeden suspekten Fall von Urogenitaltuberkulose gründlichst untersuchen, werden wir am sichersten einer Blasentuberkulose vorbeugen; es wird uns dann gelingen, die kranke Niere zu exstirpieren zu einer Zeit, wo der Krankheitsprozess noch auf dieses eine Organ beschränkt ist, ohne auch in der Blase Veränderungen hervorgerufen zu haben. Je sorgfältiger ein Arzt seine Kranken zu examinieren versteht, je gewissenhafter er auf jedes scheinbar noch so unwichtige Symptom achtet, um so seltener wird ihm eine beginnende Nierentuberkulose entgehen. Ich möchte in diesem Zusammenhange nochmals auf die Beachtung jeder auch noch so vorübergehenden Hämaturie hinweisen. Kommt der Patient erst zu einer Zeit, wo die Blasentuberkulose mit ihren subjektiven Beschwerden bereits im Vordergrunde des Krankheitsbildes steht, dann hängt die Prognose derselben davon ab, ob es noch möglich ist, den primären Krankheitsherd, also in der Regel die primär erkrankte Niere, radikal zu entfernen. Ist die andere Niere gesund, oder wenigstens noch funktionstüchtig, dann muss selbst bei weit vorgeschrittener Blasentuberkulose die tuberkulöse Niere baldigst entfernt werden. Wir haben uns immer und immer wieder überzeugt, dass durch diese Operation selbst sehr vorgeschrittene Fälle von tuberkulöser Schrumpfblase ohne jede weitere lokale Behandlung ausheilen. Meist lassen bereits wenige Tage nach der Nephrektomie die Miktionsbeschwerden nach; der Urin klärt sich in wenigen Wochen—die Pause zwischen den Miktionen wird von Woche zu Woche grösser. Daher hat sich uns eine eigentliche Behandlung der Blasentuberkulose in der Mehrzahl der Fälle als überflüssig erwiesen. Neuerdings unterstützen wir die natürliche Heilungstendenz der Blasentuberkulose nach der Nephrektomie durch eine systematische Tuberkulinkur. Wir richten uns nach den von Holdheim angegebenen Vorschriften und beginnen mit einer subcutanen Injektion von 0.0025 mg. Alttuberkulin. Die Dosis wird jedes Mal gesteigert, die Einspritzung etwa jeden dritten Tag vorgenommen. Unter dieser Kur heilt

die Blasentuberkulose entschieden schneller als in den nicht mit Tuberkulin nachbehandelten Fällen. Irgendwelche Störungen durch das Tuberkulin haben wir niemals beobachtet. Von den vielen chemischen Mitteln, die für die lokale Behandlung der Blasentuberkulose empfohlen worden sind, hat sich uns immer und immer wieder das Sublimat als das brauchbarste bewiesen. Wir verwenden dasselbe in ganz schwachen Lösungen. Wir beginnen mit 1 : 10,000, steigen allmählich bis zu 1 : 3000. Durch dünnen geknöpften Katheter injizieren wir nach vorheriger vorsichtiger Spülung der Blase etwa 20 bis 50 c.c. Sublimatlösung. Jede Dehnung der Blase wird sorgfältigst vermieden. Durch Sitzbäder und Morphium werden die durch das Medikament gelegentlich bedingten Schmerzen bekämpft. Holländer empfiehlt das Sublimat gewissermassen in statu nascendo zu geben. Es geschieht, indem der Patient innerlich Iodkali nimmt und man in die Blase Calomel injiziert. Wir haben in einigen Fällen dieses Verfahren angewandt. Es ist wesentlich schmerzhafter als die gewöhnliche Sublimatbehandlung, ohne indessen wirksamer zu sein. Weiterhin haben wir Wasserstoffsuperoxyd versucht, sowie auch die von Rovsing angegebene Karbolbehandlung. Vor letzterer möchte ich Sie auf Grund unserer Erfahrungen eindringlichst warnen. Wir bekamen in einem Falle so stürmische schwere Nachwirkungen, die den Kranken wochenlang in einen bedauernswerten Zustandversetzten, dass wir nicht mehr den Mut haben, das Mittel weiterhin anzuwenden.

Zum Schluss noch ein Wort über die direkte chirurgische Behandlung der Blasentuberkulose. Also sectio alta oder perinealis mit Auskratzung, resp. Ausschneidung der Schleimhaut. Früher, als man die Blasentuberkulose für eine aufsteigende Krankheit hielt, wurde sie gelegentlich versucht. Ihr Erfolg war wohl stets negativ. Heutzutage dürfte dieser Eingriff entsprechend unserer modernen Anschauung von der Pathogenese der Blasentuberkulose von jedem gewissenhaften Arzte verpönt werden. Denn in den wenigen schweren qualvollen Fällen von Blasentuberkulose, die so spät in Behandlung kommen, dass die Entfernung der Niere nicht mehr möglich ist, oder bei denen nach Entfernung der einen Niere auch die andere tuberkulös erkrankt und deshalb die Blase nicht zur Ausheilung kommen kann, wird man besser durch Narcotica die Qualen des Kranken mildern als sein Siechtum durch eine in ihren Folgen unberechenbare Operation noch zu vergrössern.

Tuberculosis of the Bladder.—(KARO.)

Tuberculosis of the bladder is almost always a descending process of hematogenous origin, as a rule the result of renal or genital tuberculosis.

Pathologically a distinction must be made between genuine bladder tuberculosis and tuberculous cystitis. The seat of the morbid changes

in the bladder usually depends on the mode of infection; thus in a case of right-sided renal tuberculosis the lesion is near the right ureter.

The chief symptoms of bladder tuberculosis are difficult micturition, hematuria and pyuria. The diagnosis must be confirmed by finding the tubercle bacilli, either directly in the preparation or by animal inoculation.

In every case of uro-genital tuberculosis the primary seat of the tuberculous infection must be determined as soon as possible by cystoscopy or catheterization of the ureters.

The cystoscopic picture is not in itself absolutely characteristic of tuberculosis. Nodules are also found in non-tuberculous disease.

The surest prophylactic measure to prevent tuberculosis of the bladder is early extirpation of the diseased kidney before involvement of the bladder has taken place; hence the prognosis of bladder disease depends on whether the case is operable or not.

In the great majority of cases spontaneous recovery of the bladder follows removal of the primarily diseased kidney. If the bladder does not clear up, it is often because the other kidney is also involved.

The most suitable treatment of cases of this kind is a systematic tuberculin-cure, supplemented by local treatment of the bladder with a weak bichlorid solution.

Direct surgical treatment of a tuberculous bladder is of no avail and is therefore to be deprecated.

Tuberculosis de la Vejiga.—(KARO.)

El lugar de los cambios mórbidos en la vejiga por lo general depende del modo de infección; asi pues en el caso de afección tuberculosa del riñon del lado derecho la lesión esta cerca del uréter derecho.

Los síntomas principales de la tuberculosis de la vejiga son: frecuencia de micción, hematuria y piuria. El diagnóstico debe ser confirmado por la presencia del bacilo de la tuberculosis al examen directo de la preparación, ó por inoculaciones en los animales.

En cada caso de la tuberculosis uro-genital, el lugar primero de la infección debe buscarse por medio del cistoscopio ó la cateterizacion de los uréteres. El cuadro cistoscópico no es por sí solo absolutamente característico de la tuberculosis. Pequeños nudos y prominencia en afecciones no tuberculosas. La medida profiláctica mas segura para prevenir la tuberculosis de la vejiga, es la extirpación del riñon afectado antes que este haya producido una afección de la vejiga: por lo tanto el pronóstico de la enfermedad de la vejiga depende del caso si este es operable ó no lo es. En la mayor parte de los casos una cura espontánea se observa después de

la nefrotomía del riñon primeramente afectado. Si no se observa mejoría, esto es debido à que el otro riñon está tambien afectado. El tratamiento mas apropriado para esta clase de casos es la cura sistemática por medio de la tuberculina, acompañada del tratamiento local de la vejiga por medio de las soluciones diluidas de bicloruro de mercurio. El tratamiento quirúrgico no es recomendable.

Tuberculose de la Vessie.—(KARO.)

Le siège des changements morbides dans la vessie relève ordinairement du mode d'infection; par exemple dans le cas de tuberculose rénale du côté droit la lésion est près de l'uretère droit.

Les principaux symptômes de la tuberculose de la vessie sont une micturition difficile, l'hématurie et la pyurie. Le diagnostic doit être confirmé par la découverte du bacille tuberculeux, soit directement dans la préparation, soit par inoculation animale.

Dans tous les cas de tuberculose uro-génitale le siège primaire de l'infection tuberculeuse doit être déterminé aussitôt que possible par la cystoscopie ou la cathétérisation des uretères.

L'image cystoscopique n'est pas en elle-même absolument caractéristique de la tuberculose. On trouve aussi des nodules dans des maladies non tuberculeuses.

Le moyen prophylactique le plus sûr pour empêcher la tuberculose de la vessie, c'est de se hâter d'extirper le rein malade avant que l'infection n'ait envahi la vessie; de sorte que le pronostic de la maladie de la vessie dépend de cette question: est-ce un cas opérable ou non?

Dans la grande majorité des cas, la guérison spontanée de la vessie suit l'excision du rein premièrement affecté. Si la vessie ne se nettoie pas, cela vient souvent de ce que l'autre rein est aussi infecté.

Le meilleur traitement des cas de cette espèce est une cure systématique á la tuberculine, supplémentée par un traitement local de la vessie avec une faible solution de bichlorure.

Le traitement chirurgical direct de la vessie n'offre aucun resultat.

TUBERCULOSIS OF THE BLADDER.

By Bransford Lewis, M.D.,
St. Louis.

Attempts have been made to divide vesical tuberculosis into primary and secondary infection, but extended observation of individual cases and records has shown that it is rarely if ever primary in the bladder; that vesical tuberculosis is practically always preceded by tuberculosis of some other organ or organs of the body; also, that it practically always implies infection of some other part of the genito-urinary tract. In 720 instances in which the genito-urinary organs were the seat of tuberculosis, the bladder was involved in 221 cases—30.7 per cent.

That vesical tuberculous infection is nearly always secondary is probably because the bladder mucosa is lacking in absorptive power and therefore fails to take up and absorb, until a late date, the bacilli that may be floating in the contained urine or other secretions; and yet, even though thus resistant, it lies in the pathway of two secretions that are notorious carriers of tubercle germs, namely, the urine from above, and the semen from below. So that, though retarded in its development, its ultimate implication is hardly avoidable if the primary focus continues to pour bacilli into it over a long enough period. Some little crack or crevice in the membrane is finally found to act as a point of entrance for the organisms. It is true that the semen does not itself enter the bladder, but it is also true that ascending tuberculosis makes its way along the pathway provided for the semen: the vas deferens, the seminal vesicles, ejaculatory ducts, which open into the prostatic urethra at the vesical neck. From vesicles or prostate, tuberculous infection may spread into the bladder by either continuity or contiguity of tissue: along the mucous membrane or through the adjacent tissues.

Mode of Origin.—Tuberculous infection of the bladder is accomplished in five different ways: (1) Through the blood-vessels; (2) through the lymph-channels; (3) by means of the secretions (the semen, urine, etc.); (4) by continuity; (5) by contiguity.

The early expression and location of the disease are much influenced by the mode of production of the infection. If the implantation is an ascending one, from testes and vesicles or prostate, the early manifestation will be on the trigone or the vesical neck; but if the germs have descended from a kidney by way of a ureter, the immediate neighborhood of that ureteral orifice is the point that first capitulates and becomes reddened, swelled, in-

flamed, and finally ulcerated. If the germs are received from the vascular systems, the walls of the bladder are as likely as any other parts to show the first involvement; and we then see the early ulcers scattered over the mucosa.

Marital Tuberculosis.—It has been claimed that sexual intercourse presents a mode of direct transference of tubercle bacilli and infection frequent enough to be taken into account. I have myself observed instances of this sort, one in particular, in which tuberculosis of the bladder occurred in a wife whose husband, a physician, was the subject of advanced general tuberculosis, and the coincidence was very striking; but investigation into the history of the wife showed that her own family history was not above suspicion. This question has been the subject of careful analysis by Mr. E. G. Pope, of the Adirondack Sanatorium, who concludes that there are too many sources of error to fix the responsibility of direct contagion on matrimonial association. He believes, further, that assortive mating (the tendency to select those with like marked tendencies) accounts for two-thirds and infective action for not more than one-third of the cases.* If this mode of infection were frequent, the woman would be the chief sufferer, from the deposition and retention of tubercle bacilli in the recesses and folds of the vagina; but records indicate that women are affected with vesical tuberculosis about one-third less often than men.

Mode of Development.—The stages of development of tuberculous cystitis may be divided as follows (Motz and Halle):

1. The stage of invasion and formation of tubercles.
2. The stage of inflammation and superficial ulceration.
3. The stage of deeper infiltration.
4. Stage of wide-spread destruction (Walker).

In the earliest period (invasion) there are white or gray tubercles and injected areas, without the presence, necessarily, of ulceration. Some have sought to call this "tuberculosis of the bladder," as differentiated from tuberculous cystitis; but the differentiation is artificial—they are stages of the same process.

Ulceration shows itself after the apex of the tubercle becomes necrotic and breaks down. These independent ulcers tend to coalesce and make the larger ulcers that are typical of the process. Such ulcers are sharp-edged, sometimes slightly undermined; with their surface irregular and uneven, and liable to be covered with grayish pseudomembrane, tinged with blood or small clots at times. The ulcer is surrounded by membrane whose natural luster is dimmed, which looks reddened and velvety, and whose blood-vessels are lost in the intense injection prevailing.

Clinical Evidences.—The clinical evidences may be described as those giving rise to—(*a*) suspicion; (*b*) confirmation; (*c*) conviction. Suspicion

* Quoted in Jour. Am. Med. Assn., Sept. 5, 1908.

of vesical tuberculosis should be aroused by persistent and apparently inexplicable frequency of urination, either by night or day or both; together with the appearance, over long periods of time, of blood-cells, in microscopical quantities, in the urine. In the later stages, and especially in women, pain and harassing suffering, day and night, with interruptions or loss of sleep and lowering of nerve stamina, mark the more serious phases of the disease. Persistent or recurrent bleeding is apt to take place from the ulcerated surfaces, adding to the depression, both mental and physical. More important is the persistent appearance in the urine of red cells in microscopical quantities in the early periods of the infection. It is important because it is early, furnishing the medical attendant the grounds for suspicion that, if recognized and followed up, enables him to recognize the disease at the earliest possible moment. But I have found in numerous instances that this feature was not recognized or even suspected because examinations of the urine were not sufficiently careful or searching. Such urines are often limpid, clear, and, from the macroscopical standpoint, as far above suspicion as Cæsar's wife, yet contain large numbers of red cells in every specimen voided. Frank hematuria becomes one of the outspoken danger-signals later, when inflammation or ulceration is established.

Pain is either spontaneous or excited by the act of urination. In the latter case it is most intense at the end of the act, aroused by the squeezing of the inflamed and ulcerated areas by the vesical sphincters. Pain of this character is almost constant, at one period or another, in the tuberculous bladder, and often becomes so severe as to precipitate the patient into morphin or cocain addiction. But another symptom is even more characteristic of the disease—that is, excessive tenderness and hypersensitiveness to manipulation. Appreciation of this fact should lead to the free use of local anesthesia for making any necessary local investigation.

In health the desire to urinate is aroused by irritation of the mucous membrane of the prostatic urethra or neck of the bladder. Any irritation applied at this point will arouse desire to urinate. When that irritant is urine from the full or overfilled bladder, the result is physiological desire to urinate that passes off when the bladder is evacuated; when the irritant is tuberculous inflammation or ulceration, there is good reason for the persistent and intense desire to urinate, even in the presence of a comparatively empty bladder. This desire is intensified by reason of the frequency with which the neck of the bladder is the part especially involved. Sometimes the frequency is due to reflected irritation rather than direct inflammation there, as, for instance, from renal tuberculosis, which occasionally causes frequency before the involvement of the bladder.

Among the characteristic signs of vesical tuberculosis is a marked diminution in the capacity of the bladder (contracted bladder). From three

to four ounces is a fair average capacity for such bladders, due to infiltration and thickening and lessened elasticity of the walls.

A peculiarity noticeable is that, in the face of this condition and the prolonged inflammation prevailing with it, the urine is liable to be acid in reaction. The introduction of the proteus group of bacteria sets up ammoniacal fermentation that alters this, however, establishing alkalinity and adding to the subjective complaints and activity of inflammatory processes.

Mixed Infections.—In addition to the tubercle bacilli found in tuberculous cystitis, other organisms are sometimes present and take an active part in the pathological processes. Some of them have something to do with the inauguration of the tuberculous infection, while others are followers of the tuberculous infection, adding their quota to the miserable conditions prevailing. Many cases of urinary tuberculosis have been observed as followers of urethral gonorrhea; while streptococci, staphylococci, colon bacilli, and other organisms have been found as companions of tubercle bacilli. It is considered probable that pyogenic organisms lower the resistance of the mucosa and produce minute breaks in its surface, allowing the tubercle bacilli to enter the submucosa. On the other hand, it is thought that cystitis caused by members of the proteus group does not offer so fertile a field for the invasion of tubercle bacilli as that produced by streptococci and gonococci (Walker).

Diagnosis.—While the characteristic symptoms and signs given may be sufficient to give rise to a presumptive diagnosis, the crucial factor, as with tuberculosis of other parts of the body, is the demonstration of the tubercle bacillus in connection with inflammation of the bladder. The appearance of tubercle bacilli in the urine does not by any means necessarily indicate vesical tuberculosis, as it has repeatedly been proved (Israel, Jani and Nakarai, Thilicwicz) that tubercle bacilli may float in the urine of persons whose urinary tract is innocent of any pathological lesion, even as demonstrated post mortem.

The finding or identification of the tubercle bacilli in the urine is not always easy or possible, and is largely dependent on accompanying conditions, the age and extent of the lesions, the mode of search carried out, etc. The bacilli may be sparse in number, and on that account escape detection by the ordinary methods. Bryson called attention to a useful procedure in this connection, namely, the draining off, by sterile catheter, of the small amount of urine left over after voluntary urination, as offering a better probability of gathering the bacilli that have settled at the bottom of the bladder. Precaution should always be taken against admitting smegma bacilli into the specimen—this by thorough cleansing of the glans, meatus, and urethra, over which the catheter must pass. Sedimentation should be prompt and thorough, but not too vigorous.

Failure to find the bacilli does not prove their absence, and merely stands as negative evidence; it must be supplemented with the more accurate mode

of guinea-pig inoculation of the urinary sediment. This is reliable and extremely valuable—much more so, in the writer's opinion, than the hypodermatic tuberculin test. But it requires from two to three weeks' time for maturing.

The other necessary factor for fixing the diagnosis of tuberculous cystitis is the picture presented by the cystoscope. "Seeing is believing," we are told; but it must be remembered that it requires an eye of some experience to see things accurately through the cystoscope.

The writer desires to express himself as decidedly opposed to the rather broadly disseminated view that urinary tuberculosis means interdiction of the use of instruments, either for diagnosis or for treatment. While due conservatism should be exercised in this regard, the idea that it is a forbidden field should be abandoned. That idea is no more applicable here than in other conditions requiring the ministrations of surgery and medicine. The writer has been gratified to observe participation in this view by others, notably Willy Meyer.* It has been observed in a number of cases of severe urinary tuberculosis that the repeated use of the cystoscope, together with ureter catheterization and other forms of instrumentation, have not retarded or interfered with progressive improvement or even recovery.

Cystoscopy.—While characteristic lesions, such as have previously been mentioned, are shown by the cystoscope in tuberculous inflammation and more especially ulceration of the bladder, it cannot be said that the lesions are always typical, or that they adhere to hard and fast lines of development. On this subject Casper† says: "In general, tuberculosis of the bladder does not present a specific picture: besides diffuse swelling and redness, there are at times deeply congested localized areas clearly separated from apparently healthy tissue, while again ulcerations having nothing distinctive about them are seen. Tubercles are very seldom found." Fenwick‡ says: "The primary (early) deposit is detected on the posterior wall in two forms, either diffuse, as a dull red patch or patches, or localized, as a single ulcer to the inner side of the ureteric orifice. The dull red patches betoken extravasation and exudation. I have sometimes met with cases in which a solitary ulcer was seen to the inner side of the orifice, and I could not distinguish its appearance from the solitary simple ulcer." Kneise§ gives a beautiful colored picture of what appears to be typical grayish-yellow tubercles, in the neighborhood of the ureteric orifice, and which he says were at first diagnosed as tubercles by himself and so eminent an authority as Professor Stoeckel; but further observation proved the fallacy of this diagnosis and established that of simple cystitis granulosa—all of which goes to show that the cystoscopic picture, important as it is for various reasons, is not infallible, and conclusions from it must be drawn with due consideration of the clinical history and other features of the case.

* "New York Medical Journal," April, 1907. † Bonney's translation, p. 224.
‡ "Clinical Cystoscopy," p. 172. § "Handatlas der Cystoskopie," 1908, p. 46, plate 22.

Besides the oval or rounded ulcers with sharp edges, perhaps undermined, with roughened, raw, and bleeding surface, surrounded by a zone of congestion, of velvety appearance, lacking the natural luster; with other areas of congestion either localized or diffuse—besides these characteristic appearances of the bladder mucosa itself, the ureteral orifices themselves habitually present characteristic features in connection with descending tuberculosis. These have been especially well studied by Fenwick, who says:* "One of the ureteric orifices is attacked before the other; both are never attacked equally. The orifice of that ureter on which the stress of the disease first falls changes in contour, its lips thicken, and it becomes caked and patulous. The same changes will be found in the corresponding renal pelvis, with implication of the lower part of the kidney." The same author says that where the vesical implication is a descending one from a tuberculous kidney that retracts under the ribs, the ureter becomes stretched (tense), the vesical orifice of the ureter becomes displaced, elevating the trigonal angle of that side and perhaps presenting a funneled appearance there—furnishing a diagnostic sign of material value. Instead of being an inch and a half from its fellow and the same distance from the urethral outlet, it is found to be as much as two inches from either opening, and is drawn both outward and upward.

The "therapeutic test" is a means which, sometimes applied either inadvertently or intentionally, gives a fairly good indication of the tuberculous or non-tuberculous nature of a vesical inflammation. Nitrate of silver solution, nearly always gratefully received by the infected bladder, arouses prompt additional irritation if the cystitis is of tuberculous origin.

The final definite diagnosis must occasionally be made without the demonstration of the tubercle bacillus and in spite of indefinite cystoscopic findings, the other indications present being taken as sufficient to justify a conclusion. One sometimes feels that he is in the presence of tuberculosis, without being able to elicit the distinctive, individual evidences desired. Then, too, the condition of other organs of the body, whether tuberculous or not, may have a serviceable bearing on the question.

Treatment.—The treatment of tuberculous cystitis may be divided into palliative or curative, by means of hygienic, systemic, local, and operative measures. Realizing that the affection is a secondary one, with the original focus situated at some other part of the body,—in most cases the kidney —this must be considered in adopting a plan of procedure. With, for instance, a suppurating tuberculous kidney continually draining into such a bladder, hope of definite cure could only be based on preliminary removal of the kidney; whereas, if the contributing focus were in the lungs, involved to a serious degree, palliation and amelioration of the vesical symptoms would necessarily be the more restricted aim.

* Ibid., p. 174.

Comporting with the more hopeful prognosis given to subjects of tuberculosis of other organs of the body, in this latter day, it may be conscientiously declared that a more cheering view of this condition should be entertained. Modern means and methods of coping with this form of the "white plague" amply justify this assertion.

The various systemic and hygienic influences suitable for tuberculosis in general are indicated, and it would be supererogation to rehearse them here. One fact is of striking import, however, and should be here considered: So much good can often be accomplished by local or operative measures that it is doubtful if these could be given up merely for the purpose of going away for "good air" and hygienic influences.

Any local measure adopted should be as little irritating as possible; but this does not indicate the exclusion of the catheter or cystoscope when they are needed. Obstructive conditions of the urethra should be remedied, securing free and easy transit for the urine, for which dilating is preferable to cutting. Iodoform oil emulsion, with liquid vaselin or oleolene as a vehicle, is not only soothing, but markedly beneficial. It is injected once daily, either with or without the aid of a soft catheter, and is allowed to remain in the bladder as long as possible, the patient omitting to pass the last drops in urinating subsequently.

The formaldehyd group of medicaments (urotropin, cystogen) is contraindicated; they afford no service and are often highly irritating. Creasote and guaiacol in full dosage are usually beneficial. Tuberculin treatment occupies the same position here that it does with reference to tuberculosis at other points of the body, and it should be prescribed under the same regulations.

In his former frequent use of air-inflation of the bladder in connection with air-cystoscopy, the writer observed so many instances of definite and sustained improvement that the question arose in his mind as to whether the air itself were not a beneficent factor.

Surgery has a fairly well-defined position in tuberculous cystitis, but it relates chiefly to the surgery of the contributing factors, the kidneys, ureters, testes, vesiculæ seminales, ovaries, and tubes. Experience has justified removing the original focus, suppurating kidney, or kidney and ureter; or, occasionally, the worse of two tuberculous kidneys, relieving the sufferer of a suppurating and infected organ that is doing no good, but is undermining the health and inciting infection elsewhere. It is well established that bladders are reclaimed from their unhealthy condition by removal of the kidney that has infected them, that they then undergo definite reparative changes, the ulcers heal, and the inflammation ceases.

Under such circumstances certain authors have laid much stress on total removal of the involved ureter as well, in the belief that if any of it is left behind, it will prove a source of renewed infection later. This latter claim

has, however, not been established. As above mentioned, the tuberculous bladder is able to clear up and regain its health after removal of the the suppurating kidney; why not the ureter as well? While it is theoretically better to be rid of a tuberculous ureter, its removal in serious cases cannot fail to add to the duration and seriousness of the operation, possibly to the extent of compromising the chances of the patient. In view of the doubtful advantage gained, is it worth while to run the risk? This question refers more particularly to cases of low vitality. I confess my own leaning to the negative side of the question. Two years ago, acting on this reasoning, I removed the left kidney of a young woman who was so depleted in health and strength that the medical attendants were united in the belief that she could not withstand the effects of removal of the affected ureter also. It was left behind; the patient, though in a precarious condition for several days, recovered; her bladder has since cleared up from both inflammation and ulceration; the ureter of that side has become obliterated, discharges nothing, and is not even patent to a catheter. The patient has gained about thirty pounds and her general health is practically restored.

The use of bichlorid of mercury solution, either in the form of instillations or by swabbing after curetting, with or without suprapubic access, has received high encomiums from Guyon and numerous followers, and should be tried after less heroic measures have failed. Permanent vesical fistula may become a necessity of the later stages of tuberculous ulceration, draining the bladder through a suprapubic opening in the male, or the vagina in the female. But, like the mention of it in this paper, it should be a measure of last resort

DISCUSSION.

Dr. Guy L. Hunner (Baltimore).—From the patient's standpoint, few diseases are of more importance than tuberculosis of the bladder, as few or none cause more suffering and but few are more intractable.

From the viewpoint of this great Congress, whose watchword is "prevention," I am certain that we have not given serious enough attention to the extreme menace of urinary tuberculosis as a disseminator of the plague. This must be impressed upon those who use the microscope and often see hundreds or thousands of tubercle bacilli in one field of centrifugalized urine. The danger of spreading the disease from this source is more to be considered in women, in whom the act of voiding is attended with contamination of the genitalia and clothing, whence the dried bacilli may later be given off to the patient's surroundings.

Substantial progress has been made during the past ten years, and particularly in the past five years, on the questions of etiology, diagnosis, pathology, treatment, and prognosis.

Five years ago, in a paper reporting thirty-five cases then having occurred in the practice of Howard A. Kelly and his associates, I expressed the opinion

that practically all cases of bladder tuberculosis, in women at least, are secondary to tuberculosis of the kidney. This view is now generally accepted, and it is important from the standpoint of diagnosis and treatment.

In making a diagnosis of the nature of a case of cystitis, it is my practice to consider every case one of tuberculosis until it is proved otherwise. Gonorrheal, puerperal, postoperative, and foreign body cystitis usually present a clear history and other means of a ready diagnosis. One must not forget that, even in a tuberculous case, the first-marked symptoms may arise because of a gonorrheal or other infection becoming engrafted on the more insidious disease, and setting up a sudden and more acute condition.

In any case of cystitis we suspect tuberculosis if the culture test is negative, particularly if the culture is taken on special gonorrhea media and if gonococci are absent from the centrifugalized specimen.

A cystitis that refuses to react favorably to the ordinary methods of treatment is suspicious. The presence of disease of one or both kidneys makes us more suspicious of tuberculosis.

The cystoscope is our greatest aid. In the first place, it demonstrates whether there is an actual cystitis, an important point in view of the fact that many cases in which the disease is confined to the kidney, or to the kidney and ureter, have bladder symptoms, but no cystitis. I must confess that we are not always so fortunate as to find a picture which, from the cystoscope alone, we can confidently claim to be a tuberculous cystitis. The finding of tubercle bacilli in the urine by the microscope or by the inoculation test is necessary for an absolutely positive diagnosis.

In the treatment of bladder tuberculosis we usually make but little progress until the disease in the upper tract is eradicated. I wish to call particular attention to one class of cases in which it is sometimes advisable to begin treatment at the bladder end of the urinary tract. We see an occasional case with tuberculosis of both kidneys, or tuberculosis of one kidney, ureter, and base of the bladder, with swelling of the lower end of the other ureter and a secondary pyelitis of the better kidney. It is advisable in some of these cases to begin treatment by making a vesicovaginal fistula and placing the bladder at physiological rest. This makes the patient more comfortable, especially if the tub-bath treatment be used; and by increased hours of sleep and greater capacity for food, the patient can be put in better condition for operation on the worst kidney, and at the same time the swelling of the second ureter disappears and allows a restitution of the secondarily infected kidney.

Two of my cases, one a girl of nineteen, another a woman of fifty-three, looking hopeless on first sight, because of thickening of both ureters and pus from both sides, are perfectly well to-day after following this method of treatment. The supposedly better side in each of these cases could not be catheterized because of the thickened, obstructed ureter, but the worst side was catheterized and tubercle bacilli found. In each case a vesicovaginal

fistula was made, and after decided improvement in general health the worst kidney was removed, and eventually the remaining side, which at first could not be catheterized, lost its ureter thickening and the pyelitis and cystitis entirely cleared up. In a third similar case I actually found tubercle bacilli in the urine catheterized from the better side. After a few months of treatment there was no sign of a pyelitis on this side and the bad kidney was then removed.

In the paper above referred to, written five years ago, I expressed a doubt as to whether any case of tuberculous cystitis could be cured without surgical eradication of the disease. Experience has shown that a brighter prognosis may be entertained. We must remember that the cystitis associated with tuberculosis of the kidney is often of a non-specific nature, and readily clears up after removal of the diseased kidney. I believe that some cases which are specific will clear up spontaneously in from one to five years if the patient is given a favorable environment. I believe we hasten the cure by placing the bladder at rest with a vesicovaginal fistula, although this may prove a disagreeable method to the patient. My experience corresponds with that of Guyon and Casper in the use of the bichlorid of mercury. Most patients are greatly benefited by the biweekly instillations of the mercury bichlorid in strengths of 1:40,000 up to 1:5000, and I believe the cure is hastened by this method. Whether there is a specific action of the mercury or whether the improvement results from the counterirritant action I am not prepared to say; but from the fact that silver, which is so useful in most forms of cystitis, seems to have a harmful rather than beneficial effect in the tuberculous form, it would seem that the mercury has a specific action.

Dr. Willy Meyer (New York) said there could be no question but that, in probably more than 95 per cent. of cases, tuberculosis of the bladder was a descending process, but he was firmly convinced that primary tuberculosis of the prostate, which so often followed a primary invasion of the gonococcus, did exist and was to be considered as a cause of tuberculosis of the bladder. Every means at our disposal should be exhausted in attempting to arrive at a correct diagnosis—careful history, careful examination of the twenty-four-hour urine, inoculation of guinea-pigs, *x*-ray, cystoscopy, and the various tests of the functional activity of the kidney. The *x*-ray should be used before cystoscopy, in order to exclude stone. Personally, he favored the indigo-carmin test, though none of these tests is reliable alone. The finding of ulcers on the same side as the pain in the kidney is a pretty sure sign as to which side the disease is on.

Dr. Louis E. Schmidt (Chicago) reported two cases that had consulted him on account of hematuria. In each case nephrectomy was advised. The first patient, a medical student, refused operation and went under vaccine treatment. That was a year and a half ago, and he returned three or four weeks ago, with a history that two and a half months previously he had had a

nephrectomy. Cystoscopy showed that his entire bladder was now tuberculous. The second patient consented and had a nephrectomy a year and a half ago, and when seen a few weeks ago, was entirely free from symptoms. These cases were cited to show the value of early diagnosis and nephrectomy. In the treatment of the bladder after nephrectomy, and also where the kidneys are so badly diseased that nephrectomy is not advisable, more attention should be paid to the hygienic and climatic treatment than to the local treatment.

Dr. William E. Lower (Cleveland, Ohio) said that in his experience tuberculosis of the kidneys is much more frequent in women than in men, the proportion being about three to one. He has tried all manner of treatment of the tuberculous bladder following nephrectomy, but has obtained the best results with the method of Rovsing, the injection of a 5 per cent. solution of carbolic acid into the bladder about once a week and allowing it to remain in the bladder from twenty to thirty minutes.

Dr. Korsell (Chicago) reported a case of tuberculosis of the bladder which was not accompanied by tuberculosis of the kidney. After several weeks in bed and local treatment with iodoform emulsion, together with constitutional treatment, she made a rapid recovery. The urine had been examined every day for a month by a competent man and no evidences of kidney disease were found. The origin of the infection was probably a tuberculous peritonitis, the bacilli reaching the bladder through the urine.

Dr. Karo, in closing, said the evidence offered by Dr. Korsell is not sufficient to disprove kidney tuberculosis. In the case of tuberculosis of the kidney the diseased portion of the kidney might become walled off and the case recover without interference. In his opinion it is absolutely useless to treat a tuberculous bladder so long as one or both kidneys were affected. A little experience would enable one to differentiate between the smegma bacillus and the tubercle bacillus. The smegma bacillus was shorter and thicker and differently grouped on the slide. Hygienic measures are not applicable in the case of the poorer classes. Where one kidney is tuberculous and the other healthy, nephrectomy is the operative procedure of choice. If both kidneys are affected, usually one is more so than the other, and after having found out by the phloridzin test and by determining the freezing-point of the blood, and by every other means, which of the affected kidneys is in the worse condition, he would not hesitate to make a nephrectomy on the more diseased side. He prefers to leave the ureter to take care of itself. He had not had good results from suturing the ureter in the wound.

Dr. Lewis, in closing, said he believed it would be a source of danger for one to rely with confidence on his ability to differentiate between the smegma and the tubercle bacillus in a given specimen. He would rather place his reliance on the exclusion of the smegma bacilli from the specimen than on the differences in size, shape, and grouping.

TUBERCULOSIS OF THE KIDNEY.

By Dr. Arthur Dean Bevan,
Chicago.

During the last fifteen years much light has been thrown upon the subject of kidney tuberculosis. Up to that time kidney tuberculosis was regarded as a rare lesion, difficult to diagnose, not modified by treatment, and terminating in a fatal issue. To-day it is known that kidney tuberculosis is a fairly common disease, and means have been found which make it possible to diagnose the condition early, and surgical treatment has been shown to be capable of saving the majority of patients.

In a series of more than 5000 postmortems 3 per cent. were found to have tuberculous lesions of the kidney, and of a large series of postmortems of individuals dying of tuberculosis, 10 per cent. were found to have tuberculosis of the kidneys.

Etiology.

Tuberculosis of the kidney is the result of hematogenous infection. It is probably almost always deuteropathic, and seldom, if ever, protopathic. This is true even in the cases where the clinical evidence and after-history warrant the diagnosis of primary kidney tuberculosis. In other words, primary kidney tuberculosis is seldom, if ever, protopathic in the sense that it is actually the first, the primary lesion, but it is always deuteropathic in the sense that, although it is clinically the only lesion or the first lesion to give clinical evidence of its existence, it is, in fact, secondary to some unrecognized primary lesion elsewhere, usually in a lymph-gland.

Kidney tuberculosis is in 90 per cent. or more of the cases at first unilateral, and limited to the tissue of a single kidney. The clinical evidence on this point is now very definite and convincing. There is an apparent, but not a real, difference between the clinical evidence and the autopsy findings on this point. Post-mortem examinations show a majority of cases with bilateral involvement, and, at the same time, other gross and important tuberculous lesions.

The refined, modern means of diagnosis, the exploratory operations and the nephrectomies undertaken for tuberculosis of the kidney, show that 90 per cent. or more of the cases are unilateral. The conclusion is evident that

tuberculosis of the kidney is, as a rule, at first unilateral; that later the disease extends and involves other organs and the other kidney, so that, in the fatal cases, both kidneys are usually involved. The tubercle bacilli are brought to the kidney by the blood-stream, and according to the location and character of the resulting lesions three different types are found: First, the cavernous type; the type where either in the upper or lower pole several good-sized foci develop between the capsule and the cavity of the kidney, at first not involving either the fibrous capsule or the mucous membrane lining the calyces or pelvis. These lesions break down and form tuberculous cavities varying in size from a pea to an English walnut. Later these cavities break into the calyces and pelvis and invade these structures, or at times break through the fibrous capsule and produce perinephritic processes.

The second type, the disseminate tuberculosis, is one in which, throughout the kidney, there appears a multitude of lesions of small size. This type resembles the acute hematogenous pyogenic infection of a single kidney. The third appears as an ulcerating lesion. All three of these forms may appear in the same case, and varying combinations of the three may occur. Tuberculosis of the kidney sooner or later extends to the ureter and bladder. In this connection a word on the general subject of the so-called genito-urinary tuberculosis might be of service.

We now know that there should be a distinct line drawn between genital and urinary tuberculosis. Urinary tuberculosis begins always in the kidney, and then later descends into the ureter and invades the bladder. In the male, genital tuberculosis begins usually in the epididymis, occasionally in the prostate, follows the flow of the excretions, and later invades the vas deferens and seminal vesicles, prostate, and bladder.

In the female, genital tuberculosis begins in the tubes and invades peritoneum, uterus, and ovary, but does not extend to the bladder. Both experimental and clinical evidence seems to show conclusively that the extension of the tuberculous process in urinary and genital tuberculosis is with the stream of excretion; that is, from the kidney to the bladder, and from the epididymis to the prostate and bladder. It is probable that the reverse does not occur, *i. e.*, ascending infections from epididymis to bladder and then from bladder to kidney, as was formerly generally believed. Where these extensive pictures occur, they are to be interpreted as evidences of several coincidental infections or cases of wide-spread general infection.

In the few early cases, where both the urinary and genital organs are involved, as, for instance, a single kidney and one epididymis, these are to be regarded as two independent foci, just as the occurrence of bone and joint tuberculosis in one ankle and in one hip. In fact, there is a very close parallel between tuberculosis of bones and joints and tuberculosis of the urinary and genital organs. Both are hematogenous infections, both deuteropathic and

secondary usually to an obscure lymphatic lesion. We are now well acquainted with hip tuberculosis as a unilateral lesion, and regard bilateral hip disease as a rarity. Why should we doubt when we are told that kidney tuberculosis is also a unilateral disease? Why should it be bi-lateral?

Statistics vary as to the relative frequency of the disease in men and women. The evidence would seem to point to the fact that clinically it is recognized more frequently in women than in men, but that at postmortem it is found more frequently in the male. Statistics vary also as to the frequency of involvement of the two kidneys, right and left. Some evidence seems to point to a greater frequency on the right side, this being in keeping with infections of the kidneys in general, and the explanation that the right kidney is more often movable and possibly more subject to injury and interference with its blood-supply because of this greater movability is submitted. The difference is probably not sufficient to be important, however. Küster found, in 352 cases of unilateral kidney tuberculosis, 189 in the right and 163 in the left kidney.

Gonorrhea and other pyogenic infections of the urinary organs are important etiological factors; this fact seems clearly established; the probable explanation is that these acute infections injure the structures, lower the vitality, and favor the localization of the tubercle bacilli.

I have in several cases found the combination of stone and tuberculosis in the kidney. There are two types of this picture—one with primary stone and tuberculosis (here it is probable that the stone favors the localization of the tuberculous process); the other picture is that of secondary stone and tuberculosis (here it is probable that the tuberculosis precedes, and that the secondary stone is the result of, a mixed infection present).

What is the natural history of kidney tuberculosis uninterfered with by treatment? A tuberculous process developing in a kidney might go on to spontaneous cure, as occurs in other organs and tissues of the body. The foci become encapsulated by a firm wall of connective tissue, the focus eventually being replaced by scar tissue or undergoing calcification. Although this is possible, it would seem an extremely rare termination. The autopsy and clinical evidence seem to point to the fact that the process extends and involves eventually the entire kidney. This may occur, and the lesion run a silent course, with complete destruction of the kidney tissue, and a spontaneous cure result. The kidney becomes changed to a mass of caseous material surrounded by a dense fibrous capsule, or the place of the kidney tissue may be largely taken by a mass of chronically inflamed fatty tissue. In such a case the patient is in much the same position as a patient who has a tuberculous kidney removed by operation, the diseased kidney being completely destroyed and so encapsulated as to be rendered comparatively innocuous.

Such spontaneous cures are rare, and form a small per cent. of the total cases. The usual course is the extension of the process to the pelvis, ureter, and bladder, or to the perinephritic tissues. The gradual weakening of the patient, with sooner or later wide-spread tuberculosis, with, in the majority of the cases, involvement of both kidneys and death.

Symptoms.

Kidney tuberculosis is symptomless until the process has extended to the calyces or pelvis or to the perinephritic tissues. The earliest and most important symptoms are frequency of urination and turbid urine; a cystitis, which is not clearly gonorrheal or due to instrumentation, should suggest the possibility of tuberculosis of the kidney and urinary tract, and lead to the exhaustive examination of the urine for tubercle bacilli.

Pain and tenderness in the kidney region may occur or may be absent. These symptoms vary from a mere sense of pain or discomfort in the kidney or above Poupart's ligament to the outspoken picture of kidney colic, simulating kidney colic from stone, and due to the plugging of the ureter with blood or tuberculosis débris. Hematuria occurs in about 25 per cent. of the cases, and may be severe, even fatal, or, on the other extreme, may be barely macroscopical or even microscopical in amount.

Pyuria is one of the most constant symptoms of kidney tuberculosis; mixed infection, usually due to colon bacilli, is common. The urine is usually acid in kidney tuberculosis, but may, in mixed infections, be alkaline. Increase in size of the kidney occurs in many cases, especially when there is present a perinephritic process. There may, however, be an actual decrease in the size of the organ.

Early diagnosis is of extreme importance in kidney tuberculosis. To-day the broad diagnosis of genito-urinary tuberculosis will not suffice. The diagnosis must determine the original focus, whether one or both kidneys are involved, whether the bladder is involved and to what extent, and whether there is involvement of other organs, as the lungs, etc., in the tuberculous process.

The differential diagnosis must be made between cystitis due to other causes, and pyelitis due to other infections, and such kidney lesions as kidney stone, neoplasms, polycystic degeneration of the kidneys, essential hematuria, and acute and chronic pyelonephritis, pyonephrosis, and hydronephrosis of other etiology. In the majority of cases the patient presents the symptoms and is treated for a chronic catarrh of the bladder.

Here the diagnosis must be made by the finding of tubercle bacilli in the urine. The finding of tubercle bacilli in the urine is largely a matter of care, patience, and proper technic. They can almost always be found in a tuberculous process of the kidney which is giving sufficient symptoms to drive the patient to consult a physician.

A twenty-four-hour specimen of urine should be allowed to settle, the sediment should be obtained and centrifuged, and properly stained and examined. In order to exclude smegma bacilli, the specimen should be obtained with catheter and destained with acid alcohol. A single negative examination should not be accepted. If necessary, half a dozen specimens should be examined. If tubercle bacilli are found, a cystoscopic examination of the bladder should be made, and the question of bladder and ureter involvement determined. The process, when it has involved the ureter, gives often a characteristic picture in the cystoscopic examination, redness and swelling of the mouth of the ureter on the affected side, with ecchymoses, tubercles, and ulceration.

After definitely determining the existence of a tuberculous lesion of the kidney in this way, it becomes necessary to determine the existence and the condition of a second kidney; this can best be done by catheterizing the ureters, and collecting and examining separately the right and left urines. In addition to this, where surgical treatment is considered, a cryoscopic examination of the blood is made to determine the question of kidney sufficiency. If it is normal, 55–57 or even up to 59, a nephrectomy may be safely undertaken.

Calculous pyelitis often gives the same general clinical picture as tuberculosis of the kidney. The differentiation can be made by an *x*-ray examination. The negative evidence of *x*-ray plates of the kidney region, which possess proper definition, can be relied upon, and in this way calculous disease may be excluded.

Neoplasms of the kidney, especially the common form of neoplasm in the adult,—*i. e.*, hypernephroma,—gives the symptom-complex of pain and tenderness, hematuria, and palpable enlargement, but lacks the turbid urine, frequency of urination, and cystoscopic picture of tuberculosis. Pyelitis and pyonephrosis from pus infections must be differentiated by the examination of the urine for tubercle bacilli. In polycystic disease with hematuria both kidneys are usually palpably enlarged, and no tubercle bacilli are found.

In the now small proportion of cases in which tubercle bacilli are not found in the urine, but where the clinical picture strongly suggests tuberculosis, animal inoculation may be employed or the tuberculin test resorted to.

Treatment.

Our present knowledge of kidney tuberculosis is so recent that one reads the average text-book of medicine in vain for a satisfactory description of kidney tuberculosis. The subject is usually discussed in a short paragraph in the general chapter on Tuberculosis, and is not mentioned at all in the chapters on Diseases of the Kidney. This fact may in part explain the lack

of information of the general practitioner on this subject. He has not had the subject properly presented to him. This fault should be corrected. Means must be found to instruct the family physicians that tuberculosis of the kidney is a common disease, that by proper methods the diagnosis can be made early, and, what is of the greatest importance, that the majority of the cases early diagnosed can be cured.

It is very important to have this done because the family physician sees and treats these cases in their early stage, and frequently throughout their course, and, as a rule, without recognizing the condition.

Three methods of treatment have been advocated:

1. The general hygienic treatment, which is employed in lung tuberculosis.
2. The specific treatment with tuberculin.
3. The surgical treatment.

Before discussing the treatment, let us again remind you of the fact that spontaneous cure of kidney tuberculosis is probably rare and that the cases in which a cure has apparently occurred are, as a rule, cases of unilateral kidney tuberculosis with complete destruction of the kidney and occlusion of the ureter, with resulting cessation of symptoms.

1. General hygienic treatment is of great importance, as in all cases of tuberculosis. Fresh air, proper nutrition, and rest are of much value and should always be insisted upon. Cures occur under such treatment, but, as already stated, they are rare. In the light of our present knowledge we are not warranted in depending upon hygienic treatment alone.

2. The specific treatment with tuberculin is at present on trial, especially as advocated by Wright, in very small doses and controlled by determining the opsonic index. Wright and some of his followers are enthusiastic in their claims for this treatment, especially in urinary tuberculosis. I know of several cases which have recovered under this treatment.

It goes without saying that the entire medical world will welcome with open arms and adopt with enthusiasm this treatment as soon as its value is demonstrated. Has its value been demonstrated? I am afraid not. In surgical tuberculosis in general, as gland, bone and joint, and skin tuberculosis, has it supplanted other methods of treatment? Unfortunately, no. A few cases of urinary tuberculosis have apparently recovered under this treatment, but side by side with these can be placed a much larger number of cases which have apparently recovered without any or with simple hygienic treatment. Unfortunately, for the present I think the unbiased observer must conclude that the specific method of treatment is still experimental, and is not to be relied upon to the exclusion of other methods.

3. *The surgical treatment.* We owe our present knowledge of tuberculosis of the kidney not so much to the internist, who does not have the opportunity of seeing the diseased kidney, nor to the pathologist, who sees

the tuberculous kidney in the dead, as to the general surgeons and the surgical specialists who have had the opportunity of examining the tuberculous kidney and ureter and bladder in the living, and who have been able to follow these cases and watch the results of the various operations which have been undertaken for the cure of the disease.

It is to these men we must go for the literature on kidney tuberculosis: Albarran, Tuffier, Israel, Kümmel, Garré, Kapsammer, Willy Meyer, Walker, Morris, and others. Among these we find a fairly unanimous agreement that kidney tuberculosis is a hematogenous infection. That it is early unilateral, that when it is early diagnosed, it can be cured by the removal of the focus of disease, *i. e.*, by a nephrectomy.

The nephrotomies and drainage, which were undertaken in the early development of this work, effected few if any cures, and as a result nephrotomy for kidney tuberculosis has been abandoned, except as a preliminary operation, in cases of mixed infection where the condition of the patient does not permit of an immediate nephrectomy. Resection of the portion of the kidney grossly involved has also been abandoned, because the operation gave few cures and because a careful study of the pathological anatomy shows that there are usually so many foci present that resection offers little hope of cure.

Primary nephrectomy for early unilateral kidney tuberculosis can be done with less than 5 per cent. of mortality. In Kümmel's last series, 69 cases, the mortality was but 2.7 per cent., and with the prospect of permanently curing about 80 per cent. An interesting and important fact in connection with these operations is that the limited bladder tuberculosis, which is so constant, is gradually fully recovered from after the removal of the primary focus, *i. e.*, the kidney. In the light of our present knowledge, then, we must conclude that in unilateral renal tuberculosis early nephrectomy is the best treatment. This should be combined with the well-recognized hygienic treatment of tuberculosis.

In bilateral renal tuberculosis the treatment should be the hygienic treatment plus the specific treatment with tuberculin, until at least the value of this method has been proved or disproved, and in some cases, where especially indicated, such palliative surgical measures as nephrotomy and drainage may be of service.

These well-established facts in regard to kidney tuberculosis should be widely known:

1. Kidney tuberculosis is comparatively common.
2. It is at first unilateral.
3. An early diagnosis is possible.
4. It can be cured in its early stages by appropriate treatment.

THE SURGICAL FORMS OF INTESTINAL TUBERCULOSIS.

By Dr. Henry Hartmann,

Surgeon to Bichat Hospital; Associate Professor of Surgery to the Faculty, Paris.

The history of the surgical aspect of intestinal tuberculosis is comparatively recent. One might almost say that, up to the present period, the ulcerous enteritis of consumptive patients was alone known. Intestinal tuberculosis was considered as a sequence of pulmonary tuberculosis, ulceration of the intestine and death of the patient being its constant ending. Primary tuberculosis of the intestine was hardly admitted, direct infection of the intestinal mucous membrane by food having been proved only recently through the investigations of Chauveau and Arloing. The surgeon's task was, therefore, limited to the opening of encysted suppurations in contact with the ulcerated intestine. French pathologists had, however, demonstrated that tuberculosis did not tend to caseation and ulceration alone, but could also produce sclerosis; and Grancher expressed this opinion tersely by saying that the tendency of tuberculosis was fibrocaseous.

During the same period the improvement of abdominal surgery, diminishing its risks, caused operators to open the abdomen without a precise diagnosis in cases that were not amenable to medical treatment, and to discover in that way lesions due to tuberculosis which surgery alone could cure: I mean cicatricial stenosis of the intestine.

At the same time a more thorough investigation of certain lesions, formerly considered as cases of malignant disease of the intestine or inflammatory stenosis, revealed the existence of hypertrophic or inflammatory tuberculosis of the intestine.

Finally, appendicitis itself was proved to be, in a certain number of cases, a bacillary lesion. Leaving aside the last named, we will limit ourselves to the following three points:

1. Perforations.
2. Fibrous stenosis.
3. Hypertrophic tuberculosis.

1. Intestinal Perforations.

They are more commonly located on the ileum, sometimes on the cecum and appendix, much more seldom on the ascending colon and duodenum, as shown by the statistics of Fenwick and Dodwell. The perforation can take place without the previous formation of adhesions, causing general peritonitis. Habitually, however, adhesions exist, perforation takes place into a space walled off by them, and may even bring about anastomosis with another loop of the intestine or some other hollow organ, such as the bladder. Habitually, an abscess forms, which ulcerates the skin and brings about a pyostercoral fistula.

In case of general peritonitis, operation hardly seems to have given any results; in the second case, on the contrary, a wide opening of the cavity has cured some cases; the communication between the intestinal loops can close of itself, as we have ourselves been able to observe. If a pyostercoral fistula persists, a second operation becomes possible when the patient's general condition has improved, and he may be cured by resection or excision of the affected loop, according to the case.

2. Cicatricial Stenosis of the Intestines.

Their habitual location is the small intestine, especially toward its ending. Certain exceptional cases of subcutaneous stenosis of the intestine, probably due, according to Darier, to sclerosis of lymphatic tuberculosis, may be conveniently put under the same heading.

Felix finds, from the examination of 72 cases, that 9 per cent. are situated in the first third of the small intestine, 17.8 per cent. in the second, and 73.2 per cent. in the third. The scar is transverse, perpendicular to the axis of the intestine, as was the ulceration which preceded it. It forms a band—a valve—but hardly extends lengthwise; the gut looks as though it had been tied with a string. The stricture is more or less tight; sometimes it is hardly marked; in others it will only admit a pencil or even a catheter. Exceptionally there is but one; usually there are several strictures, making the affected coil look like a pearl necklace or, when they are more distant, like a string of sausages, to use a comparison often met with in German authors. Sometimes the distance separating the strictures is very great.

Above the narrowed point, the gut is dilated; at the same time its coats are modified. Patel, who has studied these lesions well, says that when the tuberculous process is not extinguished, the specific alterations spread to the segment above; the wall is thickened by embryonal infiltration, with disseminated tubercles, especially in the submucous layer; in cases of pure stenosis, on the contrary, when the specific process is extinct, the wall of the gut is thin, and the muscular layer atrophic.

From what we have seen a sharp distinction should be made between tuberculous stenosis of the large and the small intestine. Whereas the first only gives rise to slight alterations of the segment situated above, in the second we find dilatation and hypertrophy to such a degree that sometimes the gut resembles a stomach. In case of multiple stenosis of the small intestine, all the parts situated above the lowest stenosis are thickened and dilated.

3. Hypertrophic or Inflammatory Tuberculosis.

For a long time it was confounded with malignant tumors; we established a clear distinction between them in a paper published with Pillet in 1891.

First observed on the cecum, its habitual location, this form of tuberculosis has since then been the subject of numerous articles. Sourdille, then Toupet and I, have shown that many cases of so-called syphilitic stenosis of the rectum were due to it. It was afterward described by Schiller on the descending colon, by König and Eiselsberg on the transverse colon.

Often tuberculosis of the ascending colon associates with tuberculosis of the cecum (Lartigues), that of the sigmoid flexure with tuberculosis of the rectum (Mayo Robson). Lastly, multiple hypertrophic tuberculosis of the large intestine may be met with (Bésançon and Lapointe, Gross, Hartmann). A certain number of cases have been observed on the small intestine; but, instead of being mostly near its ending, as is the case with scar-stenosis, they rather concern the jejunum, according to Bérande and Patel. MacCosh and Thacher have published a fine example of this.

Mikulicz, Mayo Robson, and Margaruci have related exceptional cases of hypertrophic tuberculosis of the duodenum.

The striking fact, in all these cases, is the thickening of the parts—such a thickening that it leads one to think of a tumor proper, all the more so as the affected part is in most cases surrounded by a mass of sclerotic fat. In contradistinction to scar-stenosis, this form of tuberculosis extends over a certain distance; the caliber is markedly diminished, the ulcerated mucous membrane bearing polypoid growths. Under the microscope the lesions differ from ordinary tuberculosis, inasmuch that, while there are specific lesions, often but little developed, there exists, at the same time, other lesions, consisting chiefly in diffuse embryonal infiltration, mostly marked in the submucous and subserous layer. These inflammatory lesions are so marked that, in our first observation, we felt obliged to speak of tuberculous typhlitis. This character is also clearly marked when the rectum is affected.

4. Symptoms, Diagnosis, Complications.

The *symptoms* depend more upon the location (small or large intestine) than upon the nature of the alterations (stenotic or hypertrophic). Stenosis of the small intestine, after a period one might call medical, marked by vague gastro-intestinal trouble (laborious digestion, vomiting, irregular stools), soon makes itself noticed by more characteristic symptoms, especially if it is situated near the end of the ileum, as is the rule.

Two or three hours after eating the patient is seized with a violent pain, that increases gradually and is accompanied by a tumefaction in the painful spot. After a few moments the pain reaches its zenith, when suddenly musical sounds are heard, the tumefaction collapses, and the pain ceases. In short, one meets the group of symptoms described by König in intestinal stenosis. Peristaltic undulation of the gut, splashing of the distended loop, are also good signs. Rarely, a tumor is felt.

Tuberculosis of the large intestine has very different symptoms. There are no musical sounds, no splashing loop; but in most cases one finds a hard tumor, which is from time to time the seat of inflammation, resembling appendicitis or sigmoiditis, as the case may be. Sometimes, even, inflammation goes further: an abscess forms, which may lead to pyostercoral fistula.

An absolute *diagnosis* is usually impossible. Tuberculosis must be suspected when the symptoms we have described are chronic and exist in a young subject. One must not attach undue importance to the condition of the lungs, surgical forms of intestinal tuberculosis generally not associating with pulmonary consumption, as does medical tuberculous enteritis. In most cases one only finds slight and torpid lesions; these are so common, in Paris at least (70 per cent. of the patients), that their presence is no clue to the specific nature of a lesion in another part of the body.

Complications of various nature may occur in surgical forms of intestinal tuberculosis. Perforation is exceptional, these forms corresponding either to healed lesions or hypertrophic inflammation, in which the coats of the intestine thicken and are even doubled in most cases by scleroadiposis. Acute occlusion has, on the contrary, been observed a certain number of times; it results either from the evolution of the stricture itself, or from adhesions or sharp bendings of the intestine. One has also seen occlusion result from mere spasm of the intestine localized at the seat of the ulceration, which explains a few cures effected by mere celiotomy. Finally, occlusion may result from intussusception, of which Bérard has collected seven cases.

5. Treatment.

Divers operations have been made. Simple celiotomy has given some good results, either by dispelling the spasm that often aggravates the stric-

ture, or by modifying in a happy way tuberculous lesions that were still in active evolution. Plastic operations, identical in their principle with those practised on the pylorus, have seldom been made.

The ideal treatment consists in resection, for alone it surely does away with the tuberculous focus, the regression of which is not certain with other methods. Unfortunately, it is not always possible, owing to the patient's general condition prohibiting a serious operation, or on account of local conditions (extensive and tough adhesions, disseminated tuberculous lesions of the peritoneum, involvement of numerous lymphatic glands, strictures widely distant one from another, etc.).

One must then resort to an indirect mode of treatment, which gives much better results than in cancer, for tuberculous lesions may regress, whereas those of cancer are fatally progressive.

Side-to-side anastomosis constitutes the simplest mode of indirect treatment; it should be used when the general condition demands a short operation; its drawback is that it imperfectly divests the contents of the intestine. It is, therefore, inferior to unilateral, and especially bilateral, exclusion of the intestine; this last operation has the advantage of completely suppressing the passage of fecal matter through the diseased gut. It may be combined with fistulization, so as to evacuate the secretions of the loop. These indirect operations often suffice to improve the condition of the patient, and secondarily the local status, in such a way that a secondary excision becomes possible and may then be performed without danger.

In case of complete occlusion, with intestinal paralysis, enterotomy may be the only thing feasible; one is obliged to resort to it notwithstanding its seriousness, which increases as the point of the gut that must be opened becomes more proximal. In order not to be placed in this plight, one must not put off the operation in cases of chronic stenosis of the intestine; one must interfere before the period of complete occlusion, before the strength of the patient fails, before his nutrition is impaired. Early interference alone can meet with the success we have a right to expect.

TUBERCULOSIS OF THE FEMALE GENERATIVE ORGANS.

By Dr. I. S. Stone,
Washington.

Dr. Stone gave a demonstration of pathological specimens, with a discussion of the subject. His conclusions were as follows:

The vast majority of tubercular diseases of these organs are secondary.

This does not mean that the primary seat or point of entrance of the infectious process is either visible or to be discovered by the most careful search.

Repeated experiments and observations fail to establish a definite method by which tuberculosis selects any organ, such as the uterine adnexa, for the implantation of the morbid process.

It is our experience to find numerous instances of "mixed infection," but we do not think a previous infection invites the implantation of tubercular disease.

Proof of the direct entrance of tubercle bacilli through the vagina into the uterus, and thence to the tubes and peritoneum, has not been obtained.

Some gynecologists are inclined to believe that many of the erosions of the cervix in virgins attended with leukorrhea are due to an invasion of the disease in question.

A diagnosis of genital tuberculosis, by one of the methods of using Koch's tuberculin, has rarely been tried. As many of the cases are associated with peritoneal tuberculosis, such inoculations have been reserved for the more extended ravages of the disease.

The frequency of genital tuberculosis cannot be precisely stated, because tedious and prolonged section work is necessary in many instances before a diagnosis can be established.

The median incision is advised, through which the peritoneum, mesentery, and perhaps other abdominal contents may be examined and treated by such operative procedures as are required.

This method is to be recommended highly, because it is possible that tuberculosis of intestine and peritoneum may readily be overlooked if vaginal operation is practised.

The curative results of hysterectomy, salpingectomy, and oöphorectomy are nearly always satisfactory, when there is but little extension of the morbid process to other organs.

TUBERCULOSIS OF THE PERITONEUM.

By Dr. F. C. Lund,
Boston.

The insidious nature of tuberculous peritonitis, the manifold forms in which it may appear, and the many conditions, both acute and chronic, which it may simulate, make it a condition of great interest both to the abdominal surgeon and the internist. Often acute in its early manifestations, it may be and is mistaken for acute appendicitis, and the operation alone reveals the nature of the diagnosis. Again, in its chronic form, it may run a latent course until perforation of a tuberculous ulcer precipitates the picture of an acute fulminating peritonitis. The contraction of the scar of a healed ulcer, or the bands and kinks resulting from adhesions, may cause acute intestinal obstruction, with all its terrors, in a case where the real but unsuspected cause is tuberculous peritonitis.

Statistical studies of tuberculous disease have been many. Grawitz and Brunn, in particular, have published statistics of 13,422 autopsies in Germany; Cummins, of 3405 in Philadelphia, etc. The consensus of opinion is that tuberculous peritonitis is found in 3 per cent. of all autopsies, and that males are affected in comparison with females in proportion of two to one. Here autopsy statistics show a wide variance from surgical statistics. Surgeons find the proportion of females to males is about two to one. More males are autopsied than females, more females are laparotomized than males; autopsies show terminal conditions, laparotomies, fortunately, earlier stages. Both laparotomies and autopsies reveal unsuspected peritoneal tuberculosis, in the latter case, usually accompanied by tuberculosis elsewhere. Neither laparotomies nor autopsies give any idea of the large number of cases which run a latent course and are never discovered.

In three cases of operation for radical cure of hernia in children, and in one case of perforating gangrenous appendicitis (streptococcus) in an adult, I have found tuberculous peritonitis present at the operation. All the patients had been well previous to the operation or attack, and remained well afterward. In these particular cases I should think it hardly fair to attribute cure to laparotomy, and feel that, without laparotomy, they might have run their course unsuspected.

Another case of interest in this connection was operated upon by another surgeon for acute appendicitis with gangrene. The records stated that the appendix had been removed. A sinus which refused to heal followed the operation, and some months afterward I removed about three inches more of appendix, which, on examination by the pathologist, proved to be tuberculous. At this second operation, owing to the number of adhesions and a tuberculosis not being suspected at the time, no investigation was made of the condition of the general cavity. The patient succumbed about a year afterward to a tuberculous peritonitis.

Statistics as to the source of the peritoneal infection are equally unsatisfactory. Primary peritoneal tuberculosis, however, rarely occurs. Although we may conceive the entrance of bacilli through the genital passages into the peritoneum direct, without the presence of a lesion in the genital tract, and although it has been experimentally found that bacilli may pass through the intestinal mucous membrane and reach the peritoneum without causing a local lesion of the former, such an entrance is the exception, rather than the rule. In the majority of cases of peritoneal tuberculosis in the female the peritonitis begins around the end of a tuberculous Fallopian tube, and in the male about a tuberculous ulcer of the appendix, cecum, or small intestine. The genital route of entrance accounts for the larger proportion of surgical cases in females than in males. Swallowed bacilli from pulmonary tuberculosis and infected milk and food account for the various forms of intestinal tuberculosis. A consideration of tuberculous peritonitis, entirely apart from tuberculosis of the female genitals and the intestinal tract, cannot be made, so close are the etiological and pathological associations. The genito-urinary tract is an occasional source of infection, and more rarely the lymphatic current from the pleura or mesenteric or mediastinal glands; still more rarely, the blood-current.

The disease is frequent during childhood, but most frequent between the ages of twenty and thirty years.

Varieties.—Aside from the mixed infections which are sometimes given as a fourth or suppurative form, we find that the various types of tuberculous peritonitis are best classified under Osler's three forms:

1. Serous, exudative, or miliary form.
2. Nodular or ulcerative form.
3. Adhesive, fibroplastic, or cystic form.

These three forms, however, grade into one another gradually and imperceptibly, and between them there is no definite line.

All three have, as a usual origin, a local peritonitis of the miliary variety, with exudation. This miliary tuberculosis most commonly spreads over the greater portion of the peritoneal cavity, and is accompanied with ascites; the omentum and small intestines are pushed by the exudate into the upper

part of the cavity; the omentum becomes curiously rolled up and thickened, and may be felt as a transverse cord extending across the upper portion of the cavity along the border of the transverse colon. The coils of small intestine may and do become adherent to each other, thickened, and fused into a mass, which may also be felt as a tumor in the upper part of the abdomen when it is pushed up by the fluid exudate, the fibroplastic process being a terminal form of the miliary tuberculosis which causes the exudate. The endothelial layer of the peritoneum is destroyed, and the adjacent coils of intestine become adherent by connective tissue of varying forms, from the "soft, spider-web or fuzz-like agglutinations" described by Murphy, to more glistening, edematous, inflamed peritoneum or even highly organized connective tissue.

Nodular Form.—The nodular or ulcerative variety is described by Murphy as a localization of the tuberculous process to numerous small areas, these areas including not only the peritoneal coat, but the deeper structures, such as the intestinal wall, mesentery, uterus, and ovaries, destroying the latter perhaps, and changing them into caseous masses, causing ulceration or perforation of the intestine, with either a localized or general peritonitis according to the condition present. In this form it will be readily seen that mixed infection may complicate the picture.

Fibroplastic Form.—When the fibroplastic process becomes general, we have the adhesions of the intestines to the abdominal wall, as well as to each other, the obliteration of the abdominal cavity, and the development of the full-fledged fibroplastic variety of the disease. Circumscribed areas of the peritoneum not becoming involved in the fibroplastic adhesions react to produce fluid, and become surrounded by the adherent coils, producing localized cysts. These cysts may become subject to mixed infections or suppuration.

Symptoms and Physical Signs.—These will vary with the point of origin, type, acuteness or chronicity, and complications of the disease. In the commonest form arising from tuberculous salpingitis we have recurrent attacks of pelvic pain, with more or less fever, not so acute, however, as in the gonorrheal or septic salpingitis. Menstrual irregularity is not marked. The tumor is, of course, felt behind the uterus, diagnosticated as a tube, and operated upon. The tuberculous process may be entirely confined to the tube, and although we find it reddened and adherent, with cheesy masses in its interior, there may be no peritoneal tuberculosis about. On the other hand, the miliary tubercles and ascites may involve the lower portion or even the whole of the peritoneum; or, the fibroplastic form prevailing, there may be the greatest difficulty in digging out the adherent tubes from the masses of adherent intestine which surround and cover them.

Where there is no pelvic pain or tubal tumor, we are left in doubt before

operation as to the origin of the disease, and the general symptoms are more prominent than the local. The same is true in regard to the cases of intestinal or appendicular origin. We have here sometimes a large tumor, due to the swollen, edematous cecum, and its accompanying mesenteric glands, with fever and bloody diarrhea, the tuberculous enteritis, which may or may not be accompanied by the miliary tuberculosis with ascites, sometimes, as is more common, the insidious onset of the miliary tuberculosis, with no definite localizable focus of infection, in which the general symptoms predominate over the local, often to the exclusion of the latter. Of these general cases the miliary ascitic variety, the chronic form, is commonest. Here belong the larger number of cases which are admitted to the medical wards for ascites, and upon which the surgeon is sometimes asked to exercise his skill. In these cases there are usually abdominal pain, mild fever, and gradual enlargement of the abdomen from fluid. Emaciation and anemia may or may not be present. The diagnosis is frequently made by the presence of a gradually increasing ascites in a young or middle-aged patient, without heart disease or any other cause for the abdominal fluid. A cancerous peritonitis is naturally sometimes impossible to distinguish from the tuberculous variety, but the age of the patient and cachexia, or the presence of a known primary intra-abdominal focus, will usually suffice.

Young patients with gradually increasing ascites and vague abdominal pains usually have tuberculous peritonitis. The surgeon who does not always think of tuberculous peritonitis in all doubtful abdominal cases with general enlargement will frequently be disappointed in diagnosis.

In sharp contradistinction to this variety is the acute form of tuberculous peritonitis. This is fortunately rare, but in its acute origin and sudden onset may and does simulate acute appendicitis and leads to immediate operation. These acute peritoneal symptoms have in one case of my own led to early laparotomy and the revealing of the condition of a tuberculous peritonitis at an early stage before tubercles had appeared. This prevented my making the diagnosis at the time, and when, unaffected by the laparotomy, the disease went on from the acute to the chronic nodular, ulcerative form, with long-continued fever mistaken at first for typhoid, great perplexity ensued, and the diagnosis was not suspected till shortly before death, nor made until the autopsy. The case presents so many points of interest that it seems worth abstracting here:

A girl of thirteen years had been ill for ten days with abdominal pain and vomiting. She had previously been a delicate child, but was attending school regularly until one week before I saw her, when she had had an attack of abdominal pain which kept her home from school for one day. I found a thin, delicate-looking girl, with a temperature of 104° F., pulse 120 and of good quality, tongue moist, color and general appearance good, abdomen

everywhere tender, but no muscular spasm. On account of the absence of spasm, high temperature, and general good appearance, the case was thought not to be acute appendicitis until two days later, when general abdominal spasm as well as tenderness were present; the temperature was 103° F., and the child looked worse. Tubal infection was thought of, and the vulva and urethra carefully examined for redness and discharge, not the slightest evidence of either being found. Median laparotomy below the umbilicus showed a greatly injected, thickened, purplish peritoneum. The cavity contained considerable dark, thick, greenish serum. The injection was greatest about the Fellopian tubes in the pelvis, and the lower portion of the omentum, which lay in the bottom of the pelvis in contact with the tubes, had on it, when drawn up, a few flakes of fresh fibrin. The tubes, while purplish and injected, were not distended and contained no pus. The appendix was greatly injected, and contained a large concretion in the tip. It was removed, and the mucous membrane throughout was found to be pale and normal, the inflammation being confined to the peritoneal covering. No sign of a tubercle could be found anywhere in the peritoneal surface. After evacuation of the fluid the abdomen was sutured without drainage. The girl's symptoms improved at first, but the temperature ran for six weeks from 101° or 102° F. at night to normal or subnormal in the forenoon. There was slight diarrhea. Negative Widal excluded typhoid. The abdomen gradually distended, and individual, thickened, distended coils could be felt in various parts of it. The girl went home and was up and about for several weeks. Then great induration of the abdominal wound developed, followed by abscess, opening, foul discharge, fecal fistula, and death six months after the operation.

Autopsy.—Miliary tuberculosis of the mucous membrane of the uterus. Marked general miliary tuberculosis of the peritoneum, with adherent intestines surrounding caseous masses, and general enlargement and caseation of the mesenteric glands. Fecal fistula in lower portion of ileum.

We had here a case of acute tuberculosis of the peritoneum in a young girl, secondary to tuberculosis of the uterus, ending in the chronic nodular form, mixed infection, and death. Murphy has called attention to the fact that tuberculosis of the uterus is usually found in childhood and old age, before and after the menopause. During the menstrual life, when the uterine mucous membrane is shed every month, it is almost unknown, while tubal tuberculosis is common. How the bacilli reached this girl's uterus is a puzzle. It seems as if they must have been introduced through the vagina. The lungs and other portions of the body at the autopsy were normal. The case was of great interest to me, first, from the simulation of acute appendicitis, and, second, from the opportunity to examine and note the appearance of an acute tuberculosis of the peritoneum before the tubercles appeared. A thickening, edema, and dull purplish congestion, with dark-greenish fluid, were the conditions, only a very little fibrin in small, dark-yellow, soft, translucent flakes being present, and that in the bottom of the pelvis, where, about the openings of the Fallopian tubes, was the starting-point of the

disease. The difference between this and the bright-red congestion, seropurulent fluid, and often abundant opaque fibrin of an acute septic appendicitis was notable.

In the fibroplastic and nodular forms of peritonitis the exudative variety has usually preceded, and after its subsidence we are confronted with the symptoms, not of the peritonitis itself, but of colicky pains due to obstruction of the bowels from kinks and bands, indurated, painful tumors due to walling off of serous or seropurulent exudate, distention of thickened coils of intestine which can be felt through the abdominal wall, with, of course, fever, emaciation, malaise, loss of appetite, and other corresponding general symptoms. The frequency of the development of tumors, due to the presence of swollen and caseated mesenteric and retroperitoneal glands, should here be noted, and the seriousness of the exhaustion and emaciation which follow this complication may readily be appreciated.

In the cases secondary to tuberculosis of the intestine, ulcers and strictures, due to internal ulceration, may be complicated by ascites and adhesions from the peritoneal process, and by edema and thickening of the mesenteric glands, etc., making a most difficult and complicated clinical picture, never twice alike. The symptoms of intestinal obstruction in the fibroplastic form are due to adhesions, bands, and kinks, and may be the first to attract attention to a peritoneal condition, as in the following case:

Mrs. L., a woman of about thirty-five years of age, of fair bright complexion, good color, and fair flesh—in other words, a healthy looking woman. She had suffered for about two years with mental depression, constipation, epigastric pain, backache, nausea, and weakness, beginning with what was called stoppage and followed three months later by a second attack. It was said that she had vomited blood. She is said to have had a lump in the right hypochondrium. Careful examination showed that the patient was a marked neurasthenic. Careful abdominal examination negative. No evidence of fluid. No distention. Slight epigastric tenderness. Symptoms of neurasthenia were so marked in this case that the patient had been treated for some time at a sanatorium. After talking with her two or three times I concluded she was too sensible to be a neurasthenic, and that there must be some serious trouble in the abdomen, although an exact diagnosis could not be made. An incision through the upper part of the right rectus exposed the pylorus, gall-bladder, and liver. Numerous tubercles were felt on the liver and abdominal wall. Reaching down through the incision a mass behind the uterus was felt in the pelvis, and tubercles of various sizes, many of them very large, were felt and seen all over the peritoneum. A median incision below the umbilicus was made, and a hernia of several loops of intestine was found through the opening in the mesentery of the ileum. The hernia was reduced and the opening sutured. A cicatricial stricture of the ileum was found, about eight inches above the ileocecal valve. Opposite the stricture, and for a considerable space on the other side, the mesentery was very much thickened and edematous, so it was

thought that resection would be impossible, and therefore a lateral anastomosis was performed around the stricture. The abdominal wall was sutured without drainage. Recovery from the operation was uneventful. The abdominal symptoms were considerably, but not completely, relieved. Constipation, as might be expected from the amount of adhesions, required constant treatment. The patient, six months after the operation, had, however, gained about ten pounds in weight and looked perfectly well.

This case illustrates the fact that surgery of the fibroplastic form of peritonitis is practically limited to surgery of the complications.

Treatment.

However complicated are the etiological and pathological problems presented by this multifold disease, the chief interest to us as surgeons lies, after all, in the treatment. The progress of the surgical treatment of tuberculous peritonitis from its accidental discovery, through its empirical stages, to its present scientific position, is one of the most interesting bits of present-day surgical history. In following the story we shall note the contributions of surgery not only to the treatment, but to the pathology of the disease, and mark the results which have followed the extension of the empirical incision and suture of the peritoneal cavity to the rational and far more effective procedure of the search for and removal of the primary focus.

The surgical treatment of tuberculous peritonitis dates from 1862, when that pioneer of abdominal surgery, Sir Spencer Wells, opened a case of tuberculous peritonitis by mistake for an ovarian cyst, sewed it up again, and saw his patient recover and remain well. Since then the operation of opening the abdomen for tuberculous peritonitis had been practised. It may be noted, in passing, that this was one of the encysted cases in which the collection of fluid in the median portion of the abdomen so closely resembles an ovarian tumor. König, however, in the year 1884, was the first formally to advise the operation, and in 1889 published 131 cases, with, he claimed, about 70 per cent. of cures. Numerous statistics of the results of surgical treatment have since been published with from 60 to 80 per cent. recoveries. Among the authors may be mentioned: König, 1890; Roessle, 1893; Margarucci, 1896; Ebstein, Krencki, Thönes, Mickulicz, Körte, and others. There have been many good surgeons and careful students of the disease, such as Schede, Czerny, Pribram, Kussmaul, Shattuck, Borchgrevink, and Fenger, who have laboriously proved, as they thought, that the results of operative treatment were no better, or slightly worse, than in cases treated medically, by tapping, tonics, etc. Through all these controversies stood out the fact that only in the operated cases which recovered could the diagnosis be absolutely made; involving unreliability in the medical statistics of recovery; and also the fact that since the operative period, the prognosis

of tuberculous peritonitis had improved from the almost absolutely bad prognosis of the seventies to the 60 to 85 per cent. "cures" of the nineties. This was partly due to the fact that in the preoperative period the diagnosis was not made before the disease was well advanced, and the light cases which recovered gave no sign; and partly to several other reasons connected with the operation. This skepticism as to the results of operative treatment resulted badly in many ways. Cases were kept under medical treatment till everything had been tried in vain before, "weary and worn and sad," they were turned over to the surgeon for a happy despatch. The method tried after everything else has failed has a bad chance, and forlorn hopes will probably always continue to be forlorn. The surgeons, however, sometimes prevailed by the argument, if this is a good thing, let us try it in time to do some good with it. The fact that many diagnoses were cleared up was not the least of the benefits conferred by surgery in these doubtful conditions. One result of many years of practice in opening abdomens was the establishment of the fact that the ascitic cases were favorable to laparotomy, while the fibroplastic were not. This result does not seem strange when we consider that we were trying the treatment of opening the abdominal cavity in cases in which there was no abdominal cavity to open, as it had been obliterated by adhesions, and that in our attempt to find a cavity somewhere the danger of opening the intestines and causing a fecal fistula, which could in no wise be induced to heal, was by no means small. The reason why, in the ascitic form, laparotomies did good, nobody knew. The admission of air, sunlight, even hostile bacteria at the operation was given the credit. Abdomens used to be held open for some time while given an interior sun-bath. Irrigation was recommended—sponging, not sponging; manipulation, avoidance of manipulation. Drainage and non-drainage had their advocates, but it soon became the general consensus that drainage was to be avoided, as carrying with it two dangers, namely, those of secondary infection and fecal fistula.

A theory which seemed plausible was that the irritation produced by the laparotomy, together with the loss of tension due to the evacuation of the fluid, determined a flow of fresh, anti-toxin-bearing blood to the peritoneum, which enabled it successfully to overcome the process. In a condition so chronic in character, however, this seemed hardly satisfactory, even in certain cases in which repeated laparotomy was followed by recovery. Bier's congestion theory was in harmony with this view, however, and it had many adherents. The theory at this time which came nearest to the truth, however, was that the adhesions and scar tissue produced by the operation tended to a localization, and consequent, at least partial, walling off and strangulation of the process. It was J. B. Murphy, about 1904, who observed, and was one of the first to appreciate, the importance of the fact

that in many cases of tuberculous peritonitis in women the Fallopian tube was thickened and presented ulcerations in the mucous membrane, and, what was more, that the end of the tube was open, floating free in the serous exudate, and discharging its contents into the abdominal cavity. He calls attention in these cases to the futility of opening the cavity and evacuating the fluid, unless at the same time the diseased tube which is the source of infection be removed.

Murphy also called attention to the fact that if the focus of supply to the peritoneum is a mesenteric gland or an appendiceal tuberculosis, its removal is indicated, as is the removal, under similar conditions, of a tube. It is this last step in advance, the recognition of the importance of the removal at operation of the cause, if possible, of the infective process, which has given us a rational basis for our treatment by laparotomy, the removal of the infective process. We may fairly assume that the cases which were laparotomized previous to our knowledge of this principle got well, some of them because they would have recovered without operation, and some because the closure of the tube or the encapsulation of some other focus by the resultant inflammation shut off the source of supply.

When the tuberculous intestine is the primary focus, if the adhesions be not too extensive or the area too great, the indication is to resect. A tuberculous cecum should be removed when possible, and if not possible on account of too extensive involvement of the ascending colon, mesenteric glands, etc., or weakness of the patient, an anastomosis around it may be made between the ileum and the transverse colon.

One of the most extensive cases which I ever met, in a thin, feeble young woman, was obviously so unfavorable to resection that I did the ileocolic anastomosis. She did beautifully, grew fat, married, and had a baby.

In a case of tuberculosis of the ileum with stricture, where resection was prevented by thickening, edema of the mesentery, and mesenteric noditis, I have successfully done lateral anastomosis around the stricture. (See case of Mrs. L.) Operations for the removal of tuberculous retrocecal glands, in some cases with caseation and abscess formation, have, in my hands, been successful and curative.

W. J. Mayo, in 1905, published a report on 144 cases and called attention to his improved results in tuberculous peritonitis, ascitic form, since removal of the infective focus was practised. Cases were cured in which several relapses and reoperations had been previously done. In the nodular or ulcerative form the surgical problem becomes entirely different and much more difficult of solution. This, more often than the previous variety, is due to enteric and glandular infection. Here, as in the adhesive variety, the greatest care must be taken in separating adhesions, lest the intestine be opened and the lamentable complication of an intractable fecal fistula result. Cysts and caseous masses, if opened, should not be drained, but dis-

infected and closed. In these two classes of cases it may be doubtful whether surgical treatment directed at the disease per se is often of benefit.

The same general statements apply to mixed infections either with one large or multiple small abscesses. They should rarely be drained. Mixed infections of tubal or appendiceal origin are, of course, treated by removal of the tube or appendix, the utmost care being taken to avoid injury to the intestine. If injury, either to the rectum or other intestine, should occur, it must be closed by several rows of sutures and wide apposition. Murphy has successfully sewn the uterus against an opening in the rectum, so as to close it.

In operating for the exudative form of tuberculous peritonitis where the cause is not known it is well to do as Mayo advises, and make the incision in the median line in women, and in men over the appendix, so as to be ready in either case for attack upon the most probable primary focus. It has been my fortune in men and boys to meet with many cases in which the primary focus could not be found. In these cases the appendix has been removed, but has been found to show no more involvement than the remainder of the peritoneal cavity. Here we have been accustomed to evacuate the fluid, wash out with salt solution, suture without drainage, and, as soon as possible, get the patient up and into the country under the best possible hygienic conditions.

BIBLIOGRAPHY.

Murphy, John B.: "Tuberculosis of the Female Genitalia and Peritoneum," Amer. Jour. Obstet., vol. xlix, 1904.

Mayo, W. J.: "Surgical Tuberculosis in the Abdominal Cavity, with Special Reference to Tuberculous Peritonitis," Jour. Amer. Med. Assoc., vol. xliv, 1905.

Bottomley, John T.: "A Consideration of Twenty-eight Cases of Tuberculous Peritonitis at The Boston City Hospital, with Particular Reference to the Results of Operative Treatment," Med. and Surg. Reports of the Boston City Hospital, eleventh series, 1900.

Hertzler, A. E.: "Hyperemia in the Treatment of Tuberculosis of the Peritoneum," Surg., Gynec., and Obst., Chicago, 1907, v, 652.

Syms, P.: "Peritoneal Tuberculosis," Am. Surg., Philadelphia, 1907, xlvi, 95–110.

Guthrie, T.: "The Treatment of Tuberculous Peritonitis," Practitioner, London, 1906, lxxvi, 642–653.

Broca: "Über die Therapie der Bauchtuberkulose im Kindesalter," Wien. med. Presse, 1906, clvii, 1505.

Neurath, R.: "Die Behandlung der Bauchfelltuberkulose im Kindesalter," Wien. med. Presse, 1906, xlvii, 565.

Büdlinger, K.: "Über die chirurgische Behandlung der Bauchfelltuberkulose," Wien. med. Presse, 1906, xlvii, 397, 464.

Johnson, R.: "Unsuspected Tuberculous Peritonitis," Practitioner, London, 1906, lxxvi, 332.

Gelpke: "Beobachtungen über tuberkulose Peritonitis an Hand von 64 operatii, teils intern behandelten Fällen," Deut. Zeitschr. f. Chir., Leipzig, 1906, lxxxiv, 512.

Schmid, H.: "Dauerresultate bei operativer und konservativer Behandlung der Peritonitis tuberculosa im Kindesalter," Jahrb. f. Kinderh., Berlin, 1907, lxvi, 399.

Dévé, F.: "La pseudotuberkulose hydatique du péritoine," Arch. de méd. exp., Paris, 1907, xix, 347.

Berard (L.) and M. Patel: "De la péritonite généralisée par perforation au cours de l'enterite tuberculeuse," Rev. de chir., Paris, 1906, xxxiii, 899.

SECTION III.

Surgery and Orthopedics (*Continued*).

FIFTH DAY.

Friday, October 2, 1908.

HYGIENIC TREATMENT OF SURGICAL TUBERCULOSIS. TUBERCULOSIS OF MUSCLES, FASCIÆ, AND TENDONS; GALL-BLADDER, PANCREAS, STOMACH, AND LIVER.

The Section was called to order by the President, Dr. Charles H. Mayo, at half-past nine o'clock.

SURGICAL BEARINGS OF TUBERCULIN.

By R. W. Philip, M. A., M. D., F. R. C. P.,

Hon. Physician to the Royal Infirmary and to the Royal Victoria Hospital for Consumption, Edinburgh.

The frequency of tuberculous lesions in surgical wards is well known. Visit a surgical clinic anywhere and any time, one of the striking features is the number of patients suffering from one or other manifestation of tuberculosis. The tuberculous lesions are of different grades. Many are, fortunately, at a stage when the injury is localized and comparatively slight. In others the disturbance has been allowed to advance until the extent of involvement is great and its limits are not readily defined. In many there is associated constitutional prejudice. Of the group of advanced cases, it is a truism to affirm—but the truism is of great significance—that, at one time, the lesions were comparatively slight and local.

Prolonged experience in the use of tuberculin for a great variety of tuberculous conditions emboldens me, physician though I be, to accept the president's invitation to take part in the work of the surgical section of the con-

gress. Tuberculin plays a double rôle in relation to so-called surgical tuberculosis. Its influence is conspicuously conservative. This is effected by its remarkable power of limitation of tuberculous disease.

In this sense it may, on the one hand, anticipate surgical interference, and even render such interference unnecessary. Or, on the other hand, it may prepare the way for surgical interference by defining and limiting the area involved. Thus, for example, in the case of glandular tuberculosis, where one or several glands are alone enlarged, the timely use of tuberculin, with careful dosage at suitable intervals, may lead to resolution of the process and prevent the need for surgical interference. I have had such experience again and again. On the other hand, there are cases where many glands are simultaneously involved and infection extends deeply, and the clinical picture produces the uncomfortable impression that, if surgical interference be undertaken, either the surgeon will have to stop half-way and admit failure, or the knife will have to pass deeply and undertake dissections the limits of which are dubious. I have in my mind cases where not several glands only were involved, but where so many were involved as to be practically uncountable, and where several had already been treated surgically with only partial success, in which brilliant results were obtained by the use of tuberculin.

I recall one case in particular where the number of glands was uncountable, and where sinuses, following, in part, surgical interference, and, in part, spontaneous rupture, formed an almost continuous chain around the front of the neck, with ugly discoloration of the adjacent skin surfaces. Within six months from the commencement of treatment by tuberculin all the sinuses healed, the glandular enlargement practically disappeared, and, save for a few scars, the skin had assumed its normal aspect. Contrariwise, I recall cases where tuberculin was either excluded from the first, or dropped after its use had been undertaken, and where, through haste to obtain result, operation after operation was performed, only to be followed by disappointment.

In many such difficult cases the most favorable result is obtained by a judicious combination of tuberculin treatment with surgical interference. In presence of enlarged glands I recommend that treatment be commenced with tuberculin in minute doses at carefully regulated intervals. I shall refer to the details of procedure presently. In some instances the employment of tuberculin may alone suffice to cause resolution. Even when many glands are involved, tuberculin will lead to resolution of the majority, more especially those located at the greatest distance. If suppuration be determined in one or several glands, surgical interference for the relief of this may be undertaken, the use of tuberculin being maintained. It is remarkable how rapidly evacuation of pus is effected in such circumstances, and a healthy

cicatrization follows. Tuberculin is no less serviceable in relation to localized tuberculosis of bones and joints. In all cases, but especially in the osseous and articular group, advantage seems to be obtained by the introduction of tuberculin directly within the affected area.

There remains for consideration a large group of difficult conditions in which frequently tuberculin may replace surgical interference entirely. This group includes two classes:

(*a*) Certain obscure cases where localization of lesion is not exact, or where operative procedure is doubtful or has been fruitless.

I might cite several examples. For the present, it may suffice to record one striking case which has recently been under my observation. The patient, a young lady of thirty, came to me three years ago, on account of a distressing discharge of pus *per rectum*, amounting to some eight to ten ounces daily. The discharge had continued for almost four years. During that time she had had the best surgical advice. Two surgical operations had been undertaken by way of the rectum. More recently, a laparotomy had been performed with a view to clearing up the diagnosis and effecting a cure. In spite of such heroic measures, carefully carried out, with the addition of long-continued rest on open-air lines, the discharge, when I first saw her, was, she informed me, as great as ever. Examination showed the traces of the surgical interference, not merely in the superficial scar, but, unfortunately, also in a cicatricial narrowing of the rectum, which was the cause of much mechanical difficulty in defecation. High up, as far as the finger could reach, there was felt to be a considerable boggy area in relation to the posterior, or sacral, aspect of the rectum. Pressure over this area caused pain and bleeding and the discharge of pus. It was to this area that the rectal operations had been especially directed.

Concluding that the lesion was of tuberculous nature, and having regard to the complete lack of success of repeated surgical interference, I proposed treatment by tuberculin. The result was remarkable. After the first two or three injections improvement was noted by the patient. Within three months the discharge of pus, which had lasted almost four years, was greatly reduced, and, at the end of six months, had entirely disappeared. The patient's general condition improved simultaneously. For two years she has been free from any trace of discharge, and, apart from the distressing consequences of the operative interference (rectal cicatrization and hernial bulging of the abdominal wall), has been well.

(*b*) Tuberculin may similarly replace surgical interference in a number of admittedly inoperable cases. Here I content myself with reference to extensive genito-urinary tuberculosis, with involvement of kidneys, bladder, and presumably other parts where radical surgical interference would be impossible. In such cases the effect of careful and continued use of tuber-

culin is very remarkable. I have had a large series of such cases, and the net result has been satisfactory. In every instance so far improvement has been achieved, and in many the improvement has amounted to cure. Thus, I have had cases where life was made miserable day and night by frequency of micturition, vesical relief being called for every hour or more frequently, and where, after a dozen or two injections, micturition was restored to normal order. In other cases large discharge of pus has been reduced to a minimum or has been made to disappear, and likewise tubercle bacilli have disappeared or been greatly reduced.

In such cases, even if absolute cure be not effected, it is of vast significance to the patient that at least the more urgent symptoms, which make life hardly worth living, should be removed. The relief reported by many patients is most gratifying.

In other affections, where the leading symptom is traceable to tuberculous involvement, *e. g.*, the distressing dysphagia which accompanies tuberculous involvement of the epiglottis, I have confidence in recommending the use of tuberculin as likely to be followed by the reduction or disappearance of the symptom, even if completer cure be not always obtained.

Of the various tuberculins, I have used several, including more especially Koch's Original Tuberculin, Koch's TR, and, more recently, Béraneck's tuberculin. The last named seems to me worthy of special consideration. Each case requires to be judged *per se*, but the general plan of treatment is uniform. It has been my rule to commence with minute doses—thus, of Koch's Original Tuberculin, 0.0001 gram, of TR tuberculin $\frac{1}{5000}$ to $\frac{1}{2000}$ milligram, and of Béraneck's tuberculin 0.1 c.c. of a 1 : 100,000 solution. Dilutions are made with normal saline solution. Injection is repeated at intervals of from three to fourteen days, according to the nature of the case and the effect produced. The effect is gaged by careful record of temperature, pulse, general condition of patient, and local manifestations. Although my observations have been controlled in many instances by daily estimation of the opsonic index, I do not think this is necessary. I am satisfied that the amount and frequency of dosage may be regulated sufficiently—indeed, regulated fully as well—by clinical evidence.

My practice has been to commence with the smallest dose that seemed likely to be effective, and thereafter to proceed with treatment very gradually at sufficiently wide intervals. It is commonly desirable to repeat the same dose on more than one successive occasion, so as to be sure that no reaction has been missed. Thereafter the dose may be progressively increased in similar fashion until a considerably larger dose is attained.

It is especially important to commence with small doses when the surgical lesion is internal, or, if external, is associated with visceral tuberculosis, *e. g.*, pulmonary, or when although no internal lesion is determinable, there is much constitutional prejudice.

When, contrariwise, the surgical lesion seems entirely external, it is permissible to commence with larger doses, the same precaution being followed in respect of clinical observation and progressive graduation of dosage.

Sometimes, when the disease is certainly external, direct introduction of tuberculin into the diseased area is to be recommended. In such cases also the stronger solutions may be used. Thus, of Béraneck's tuberculin, I have commenced with $\frac{1}{10}$ c.c. of 1:100. After injection, the affected area must be carefully observed. If there is trace of local reaction, no further injection is made until this has disappeared. If, as commonly happens, all trace of reaction has disappeared, at the end of a week the same dose is repeated. If no local reaction has taken place or the reaction has been slight, the dose is increased $\frac{1}{10}$ c.c., and so on gradually, a pause being always made in presence of definite reaction until all trace of reaction has disappeared.

La Tuberculina en los Casos Quirúrgicos.—(PHILIP.)

La tuberculina un agente valioso en la cirugía conservativa.

Ejemplos.—La tuberculina puede reemplazar las interposiciones quirúrgicas. (*a*) En ciertos casos oscuros, cuando el diagnóstico principal no es exacto, ó cuando los procedimientos quirúrgicos son dudosos ó no han tenido éxito. (*b*) En un número de los casos inoperables v. g. en una extusa afección tuberculosa de los organos genito-urinarios, en la cual el tratamiento operativo radical es imposible.

Aspects Chirurgicaux de la Tuberculine.—(PHILIP.)

La tuberculine est un agent important de la chirurgie conservative.

Exemples.—La tuberculine peut remplacer l'intervention du chirurgien: (*a*) dans certains cas obscurs, où le diagnostic topique n'est pas exact, ou quand le succès de l'opération est douteux, ou que l'opération n'a pas réussi. (*b*) Dans nombre de cas non opérables, par exemple, la tuberculose génito-urinaire étendue dans laquelle une intervention chirurgicale radicale peut être impossible.

Über die Stellung des Tuberculins in der Chirurgie.—(PHILIP.)

Das Tuberculin ist ein werthvolles Mittel in der conservativen Chirurgie.

Beispiele.—Das Tuberculin kann einen chirurgischen Eingriff ersetzen: (*a*) In gewissen Fällen, in denen eine topische Diagnose nicht mit Sicherheit gestellt werden kann, oder wenn das Resultat des operativen Eingriffes entweder zweifelhaft oder fruchtlos war. (*b*) In einer Anzahl nicht operirbarer Fälle, wie z. B. bei ausgedehnter Tuberculose der Harn- und Geschlechtsorgane, in denen ein radicales chirurgisches Eingreifen eventuell unmöglich ist.

TUBERCULOSIS OF BONES AND JOINTS.

By Edward H. Bradford, M.D.,
Boston.

In the study of the control of tuberculosis attention has been turned more particularly to that form of tuberculous disease which attacks the organs of respiration, for the reason that pulmonary tuberculosis is regarded as one of the chief sources of contagion, and also popularly as the type of the white plague. The suppression, however, of other forms of tuberculosis is of equal importance.

The present paper will attempt to call attention to one of the most common forms of tuberculosis which comes under the attention of the surgeon, viz., tuberculosis of the bones and joints.

Tuberculous periostitis, tuberculous involvement of the glands, tuberculosis of the kidney, of the testis and the prostate, of the mesenteric glands and larynx, are all classed as surgical tuberculosis. But the surgical treatment varies with the locality invaded, and needs special surgical consideration as to the question of surgical interference. All treatment, however, must be subject to the treatment of the patient's condition, which is at present regarded as the development of an immunity from the tuberculous infection.

This is equally true when the tissues attacked are or are not accessible to surgical interference. When the tissues invaded are placed under suitable conditions, healing takes place and the affected tissues become cicatrized. The detritus of diseased tissues is either thrown off or encapsulated.

In tissues within the reach of surgical interference the surgeon is to decide whether the healing process can be hastened by removing the affected tissues or the detritus. This depends upon both the nature of the tissues and the anatomical situation of the parts affected.

These considerations are particularly important in bone tuberculosis and tuberculosis of the joints, for the reason that bone is a tissue that cicatrizes slowly and the articulations are especially exposed to bruising and trauma, which are unfavorable to the healing of tuberculous tissues.

The treatment of surgical tuberculosis consists, therefore, in operative interference and the promotion of healing by protecting the tissues, in

addition to furnishing such measures as are useful in combating tuberculosis in general.

General Measures.

Of the measures which are of importance for the general treatment of tuberculosis, fresh air is of as much value in bone and joint tuberculosis as in any other form of tuberculous infection. Although this fact has been surmised for a long time, it is only within a comparatively short time that the important agency of fresh air as a tonic has begun to be realized. The opposition to drafts, to cold air, the fear of "catching cold," which is an obstacle to be overcome in the treatment of pulmonary phthisis, is even greater in many instances in bone and joint tuberculosis, which more frequently attacks young and delicate children, guarded as they usually are with the solicitude and tradition of domestic nursing.

Even physicians who have learned to regard fresh air as beneficial in phthisis have frequently not thought that in bone tuberculosis, where the affected tissues are not accessible to fresh air, the same benefit can be obtained. There is a dread of added complication induced by the chilling of the surface temperature which has deterred attempts at what is regarded as exposure.

But accumulated experience, from many regions and many climates, is convincing as to the gain to be obtained from the tonic of pure air, no less in bone tuberculosis than in other varieties. It is unnecessary to speculate here as to the mode of action of this tonic, but it is desirable to determine in what cases it is especially beneficial.

The illustrations of benefit from fresh-air treatment in tuberculous children have been so numerous that it might be considered superfluous to cite further illustrations, but the experience gained from the open-air treatment at the Wellesley Country Convalescent Home of the Boston Children's Hospital is in some respects unusual, as the cases were not those taken directly from the slums, but from the wards of a well-appointed city hospital, without unusual provision for fresh air, though with the usual ventilation of a hospital built twenty-five years ago.

Owing to delay in constructing the fresh-air shack added to the facilities of the Country Home, which was to have been opened in the early autumn, patients were not admitted until the early winter, and children suffering from hip disease and diseases of the spine were first placed under continued fresh-air treatment, not in the milder weather, but in winter, when the thermometer ranged from zero to ten and twelve degrees below. The improvement in these cases was immediate and surprisingly great—in appetite, general condition, weight, and hemoglobin percentage. This was true not only of children capable of activity, but also of children who were confined

to recumbent frames and moved about on movable stretchers. It was found, however, that the cases with increasing and undrained abscesses did not gain as rapidly as those with sinuses. In certain cases no gain followed fresh-air treatment, and, although it is difficult to generalize absolutely, it appeared that those suffering from the acuter forms of surgical intervention were less benefited by fresh-air treatment than those in a more chronic condition.

It appeared in many instances that the benefit from the fresh air was largely an improvement of the metabolism from the general tonic, which was as marked, if not more so, in the cold air of a severe winter as in the summer. The dry, clear, sun-lit cold apparently served as a stimulant, provided the children were warmly clothed and were able to respond to the stimulus.

It is not yet determined that sea air has any especial advantage over mountain air, or even over fresh air. It is probable that this question in reality is the practical one for each locality in favor of that region which is accessible and which furnishes the most equable temperature. What is needed is the maximum of fresh air with the least sudden variation of heat and cold, dryness and humidity.

In advanced cases of phthisis the husbanding of the patient's strength is of the greatest importance, and activity which brings an added strain upon the lungs is to be avoided. The condition is different in bone and even joint tuberculosis. Increased circulation does not of itself devitalize or injure a local tuberculous process in bone, and activity, when it can be made possible without irritation to the local bone lesion, is not only not injurious, but even beneficial, especially in children where activity is an essential to normal life.

It has been suggested that increased metabolism may increase the danger of the generalization of the tuberculous process, where the immunity has not been yet established; for this reason it is manifestly not desirable to encourage activity during the stage of elevated temperature or rapid pulse, which may be regarded as a period when the patient is in the struggle of infection; but this stage is brief, and may be absent in bone and joint tuberculosis.

Activity, however, may be regarded, like massage and hydrotherapeutics, as a method of promoting a more normal metabolism, and under guidance it may be made the most beneficial of all methods for this purpose.

Surgical Treatment.

The present surgical treatment of bone tuberculosis may be regarded as having developed from that of the past to the extent of retaining the essence of that which was useful in past surgery, with the addition of the teaching of more recent experience. The fixation of the joints is important at a certain stage, namely, the stage of acute invasion; but it is not needed at all stages, and greater freedom should be allowed in the convalescent stages, where the

exercise and hyperemia of slight motion are found to be of advantage in restoring function to the cicatrized periarticular tissues. Counterirritants, which were considered of so great value by the surgeons of the past generation, now find their place in the hyperemia treatment which is of benefit in reducing the sluggish congestion of swollen periarticular tissue. Operative interference is of proved value in advanced cases with marked necrosis, and the value of perfected mechanisms in the prevention of deformity has been abundantly proved.

It is evident that in the surgical treatment of bone tuberculosis the indications for surgical interference will vary with the locality attacked. The treatment of tuberculosis of the vertebral bodies will necessarily be different from that of tuberculosis of the sternum. Certain general principles, however, must be borne in mind by surgeons. Although it was at one time thought that all tuberculous foci demanded surgical interference, and all bone tissues invaded by the tuberculosis process needed extirpation, at present the tendency of surgical belief is toward a more conservative policy. Tuberculous invasion attacks the spongy portion of the bone, and by preference that portion of the spongy portion where the development of new cells is likely to take place, namely, the epiphyses or the juxta-epiphyseal region. Hard, dense bone is ordinarily resistant to the tuberculous invasion. The spreading of tuberculous invasion in bone is probably not rapid, and is usually accompanied by the development of cicatricial bone tissue surrounding the focus or the portion invaded. Bone tuberculosis may be regarded as a conflict between the invading tuberculous processes and the resistant cicatrizing processes, with the chances in favor of the resisting tissue if proper conditions are furnished. Although this is true of tuberculous invasion of all tissue, it is especially so in bone tuberculosis, owing to the firm and resisting texture of certain portions of the bone tissue. The circumscribed cicatricial ostitis in the majority of cases gains and establishes a cure, either by encysting the tuberculous mass or by the gradual substitution of dense cicatricial bone in the place of the spongy bone tissue diseased by the tuberculous invasion. The surgical treatment should therefore be directed toward aiding this natural tendency to cicatrization rather than interrupting it. Formerly tuberculous tissue was regarded as semi-malignant, and therefore demanding excision to prevent the danger of a generalized process. At present it may be said that it is not desirable to destroy the encircling cicatrizing hard bone process unless it is necessary to free a mass of detritus or necrotic bone too great to allow reëstablishment of normal bone.

The surgeon should bear in mind, therefore, that as far as possible it is necessary to avoid injury to cicatricial bone tissue. Injury to this tissue not only weakens the protection against a generalization of the process, but, in the resulting bruised tissue, furnishes a soil for the local spread of the tuber-

culous ostitis. It is impossible for the surgeon by any means of intervention, by the use of the curet or the chisel, to avoid bruising the sounder bone in the vicinity of the diseased tissue. Unless a patient has already established an immunity, such bruising of the young cell growth furnishes an excellent medium for the development of tuberculous tissue, and instead of a brilliant result following the surgical intervention, in too many instances the ultimate condition of the patient is not satisfactory. Direct surgical intervention must not, therefore, be regarded as an essential of treatment, but as a measure to be resorted to in the more severe cases. A dread, however, of surgical intervention in bone tuberculosis is to be rejected as irrational. Bone heals as completely as other tissues, though somewhat more slowly.

In the early preaseptic days surgeons regarded operative intervention upon tuberculous bone with hesitation; rest and counterirritation were the important remedies. Later, bone tuberculosis was classed as an evil to be eradicated thoroughly. At present a middle course seems more wise. A combination of the constitutional bone protection and operative methods may be said to constitute the modern treatment of bone tuberculosis.

It is of prime importance that the surgeon should provide that all bone tissue attacked by tuberculosis should be protected from bruises, jars, or repeated trauma. The importance of this is seen in the fact that bone tuberculosis in the upper extremity is less destructive and more easily arrested than bone tuberculosis in the larger joints of the lower extremity or in the spinal column. In extensive bone tuberculosis the periarticular tissues of the capsules of the synovial membrane usually become involved, and at times all motion of the joint is painful. When, however, cicatrization and cure have been nearly established, some motion at the joint is not only harmless, but may be beneficial.

Another factor which it is necessary for the surgeon to bear in mind is the danger of mixed infection. It has been shown that in the majority of fatal cases of joint tuberculosis death does not result from tuberculous generalization so much as from a septicemia due to specific infection of the tuberculous bone. The surgeon should as far as possible avoid all chance of the invasion of the pus-forming germs, and for that reason active surgical intervention demands the most careful aseptic precautions both during operation and in long subsequent after-treatment.

A factor of importance in the treatment of joint tuberculosis consists in the prevention of deformities which necessarily follow the natural cure of joint tuberculosis and caries of the spine. The surgeon, therefore, has to consider: the question of the eradication or drainage of the tuberculous focus; the protection of the affected tissue by proper mechanical treatment; the fostering of all attempts at normal bone cicatrization; the use of bandages, fixation supports, and apparatus for the fixation of inflamed joints;

and, finally, the prevention or correction of deformities by adequate protection during the long period necessary for the transformation of the ostitic bone to firm tissue.

In the past generation it was taught that the projection in a humpback was to be favored as the best means of establishing a substantial recovery. At present a deformed spine is a reproach to those in charge of a child attacked with vertebral caries. The results in the treatment of hip disease, *i. e.*, tuberculous coxitis, are now almost as satisfactory.

The great improvement in the treatment of bone tuberculosis can be seen if a comparison is made between the mortality statistics of forty years ago and the results obtained in more recent treatment. The mortality from hip diseases thirty and forty years ago reported in several German clinics is as follows:

At Tübingen	40	per cent.	
At Kiel	48.5	"	Non-operative cases.
At Kiel	53	"	Operative cases.
At Marburg	35	"	Non-operative cases.
At Marburg	40	"	Operative cases.
At Heidelberg	46	"	Non-operative cases.
At Heidelberg	50	"	Operative cases.
At Göttingen	40.3	"	

The improved results of more careful special treatment were reported fifteen years ago by Gibney in New York at 12.5 per cent. Menard, at Berck-sur-Mer, out of a large number of cases recently reported a mortality of only 7 per cent. Accurate statistics of the Boston Children's Hospital, in 606 cases, including those operated upon, gave a 4 per cent. mortality. In 100 cases where the ultimate result, ten years after the end of treatment, could be determined, including deaths from intercurrent disease, the percentage was equally favorable. It is also true that the functional results obtained by careful treatment are equally satisfactory in the prevention of deformity and the resulting functional disability, so that it may be claimed that a complete cure is possible in early cases placed under favorable conditions and under proper care.

Accurate statistics in Pott's disease would show in all probability an even more marked improvement. But statistics of Pott's disease have not been as carefully collected as of hip disease. Such as have been collected show so great an improvement that it would appear that the late Dr. Sayre was justified in claiming that hereafter there need be no more humpbacks. Out of 975 cases untreated, reported by Rozoy and quoted in Whitman's "Treatise on Orthopedic Surgery," there were 244 deaths. In 47 cases with paralysis reported by Taylor, 39 recovered completely, 5 died of intercurrent disease. The mortality, according to Meyer, in hospital cases was only 3 per cent. Of 47 cases of paraplegia treated by Gibney, only 9 died. These statistics refer more especially to cases suffering from paralysis.

An attempt was made to find the general mortality in cases which had been treated in the Boston Children's Hospital. The inquiry concerned only the cases in which the ultimate result could be determined ten years after treatment. There were 38 of these cases, and of these, in ten years, only 3 had died; two of these were deaths directly from the results of caries of the spine, and one from an undetermined cause.

General Considerations.—The subject of bone and joint tuberculosis needs, in addition to the study of the results of treatment of individual cases, a broader consideration of the subject. The relation of the affected individual to society must be determined, as well as what steps the community should take, not only for the care of the individual afflicted, but also toward the protection of other individuals and the prevention of the disease among the poorer classes of society.

One of the most important considerations is the following: Should cases with bone and joint tuberculosis be isolated, or to what extent are they to be isolated? The fear of tuberculosis which has recently been brought into our communities is such that the doors of many charitable institutions are closed against bone tuberculosis. There can be no doubt that the danger of contagion from bone tuberculosis is greatly exaggerated. It is not probable that a patient suffering from a tuberculous focus in one of the vertebral bodies is to be regarded a source of contagion if such a focus is encapsulated. There can therefore be no danger in the admission of such patients into the wards of a general hospital or convalescents' home. The same is true of the tuberculous affection of the hip, of the larger joints, or of the osseous system elsewhere. These affections differ entirely from pulmonary tuberculosis, where the sputa offer a ready source of contagion. It is to be remembered that in bone tuberculosis where abscesses have developed, the danger of contagion can be lessened by proper surgical dressings, and the danger of communication of disease is no greater than that from ordinary sepsis.

Home Care versus Institution Care.—As the majority of these cases occur in children, home influences, when favorable, furnish the best environment, and are preferable to institutional care, provided, of course, that home care can be thorough, devoted, and continued. These conditions are not always possible, and for this reason a large number of cases of bone tuberculosis will need institutional treatment. For it must be admitted that the thorough care of the patient suffering from caries of the spine or tuberculosis of the hip involves a considerable tax upon the nursing resources of the home.

Country Convalescent Homes.—The value of these institutions in the treatment of bone tuberculosis cannot be exaggerated. Few homes furnish the requirements of fresh air which can be given in properly regulated convalescent homes. A convalescent's home should be situated where it will enable the patient to enjoy the benefit of fresh air for as long a period as

possible. Where convalescents' homes are placed in localities exposed to severe winters, especially to cold with high humidity, it appears that patients can have a greater opportunity of benefit from fresh air if the convalescent home is situated in a locality protected from the fierce winter gales and severe cold prevalent along the North Atlantic coast. There are great benefits to be derived, however, from seashore homes during the hot months.

Schools for Patients with Bone Tuberculosis.—As bone tuberculosis in its usual form requires for its complete cure a long period of time, children would be deprived of educational advantages if, during the convalescent stage, they were unable to attend school. It is to be remembered that large bone foci not only require time for healing, but unless they are thoroughly healed, so that the affected bone is capable not only of weight-bearing, but also of resisting an unusual amount of jar with the possibility of relaxing, and that under these circumstances school-children not only should be free from any tax upon their constitutional strength entailed by long school hours, but also should be protected from the rough play of schools with healthy children. It is for this reason that special arrangement of school work is advisable. This requirement can be met by the establishment of special schools: these can be either the day-school or the boarding-school. The children in institutions of this kind should receive proper instruction and the regulation of the hours of play, proper nourishment, and with the regulation of the proper amount of rest to prevent the exhaustion of study or play.

Organization for the Treatment and Care of Bone Tuberculosis.—The prevalence of joint and bone tuberculosis, especially in the poorer quarters of our cities, is sufficient to justify organized attempt to check this form of tuberculosis. The measures that will be required are different from those which are needed to eradicate pulmonary tuberculosis, and may be briefly summarized as follows:

The erection and support of some means for the furnishing of special surgical treatment, whereby operative interference, the furnishing of proper bandages or supports, and the recognition, record, and study of these affections are obtained.

The organization of a home relief department which will see that among the poor the necessary treatment may be thoroughly carried out at home.

The establishment of convalescent outdoor homes or seashore homes with facilities for instruction and education, as well as the nurture, of this class of patients. These institutions and organizations should supplement the organizations for the combating of tuberculosis in general. With the establishment of such organizations, thoroughly and efficiently equipped, it would be found that not only will bone and joint tuberculosis be checked, but the type of the disease would be gradually modified to such an extent as to become but a slight menace, which will be eventually eliminated from our communities.

OPEN-AIR AND HYPEREMIC TREATMENT AS POWERFUL AIDS IN THE MANAGEMENT OF COMPLICATED SURGICAL TUBERCULOSIS IN ADULTS.

By Willy Meyer, M.D.,
New York.
Professor of Surgery at the New York Postgraduate Medical School and Hospital; Attending Surgeon to the German Hospital; Consulting Surgeon to the New York Skin and Cancer Hospital and New York Infirmary.

There are some localities in the body in which bone tuberculosis, though operable, cannot be cured by operation alone. Tuberculous affection of the os sacrum is one type of this class of cases; that of the pelvis, *e. g.*, acetabulitis complicated with suppurating coxitis, another. The persistent sinuses following resection of the hip-joint often baffle the surgeon's skill and patience.

Cold abscess formation as a result of tuberculosis of the pelvis, especially if recurring again and again, is always a grave complication, and particularly so, in adults.

It is true, much can be accomplished nowadays by filling the cold abscess cavity after evacuation of the pus through a trocar, with iodoform emulsion (iodoform suspended in sterilized glycerin), following up this process by the faithful and persistent use of hyperemia for the diseased bone or joint. Still, there are cases that resist all our efforts in this direction. It is here that additional open-air treatment may become the means also in adult cases of saving limb or life.

The literature in this respect, at least in so far as the treatment of older patients is concerned, is rather meager. Halstead, of Baltimore, in 1905, read a paper before the first annual meeting of the International Association for the Study and Prevention of Tuberculosis, on the Results of the Open-air Treatment of Surgical Tuberculosis. In said paper he sets forth the beneficial influence of fresh-air treatment in tuberculous bone affections, and gives his personal experience with the method.

What has been accomplished in the young with this method is well known. The reports issued by the various seaside resorts abroad, as also the Sea-Breeze Hospital in Coney Island, maintained by the New York Association for Improving the Condition of the Poor, furnish ample proof in this direction.

The following three cases, selected from a number of similar ones that have come under my care within the last few years, will serve to illustrate the point in question:

CASE I.—*Tuberculosis of the os sacrum, involving both iliosacral joints and the fifth lumbar vertebra with its articulation.*

Mr. I. V., who had suffered from repeated slight attacks of hemorrhage from the lungs during the past few years, came under my care in April, 1906, on account of a cold abscess over the left iliosacral joint. The os sacrum was swollen and tender in its upper part, as was also the neighboring pelvic bone. In view of the patient's reduced general condition, more serious operative intervention could not be considered at the time. The abscess was evacuated under local ethyl chlorid cocain anesthesia, and then filled with a 5 per cent. emulsion of sterilized iodoform glycerin. There was little reaction; the patient was put on a nourishing diet and remained under the care of a nurse. Three weeks later and again four weeks thereafter, the procedure had to be repeated, as the abscess had refilled. Soon afterward a discharging sinus formed. As the patient had large business interests at stake and time was an important item, the excision of the iliosacral articulation was seriously considered. However, increasing swelling and tenderness of the right (opposite) iliosacral articulation rendered operative work out of the question. There could be no doubt that the entire upper part of the os sacrum was involved in the disease.

In former times such a patient was usually doomed. To-day we have learned that conservative methods of treatment may yet, at times, accomplish a cure in these cases. Fortunately, the patient belonged to that class that need not count the cost in trying to regain health.

Accompanied by a nurse, he was sent to the mountains, where he was so fortunate as to come under the care of a most thorough and learned colleague. He was kept on his back, lived in the open, day and night, was put upon a forced diet, had general massage and proper internal medication. A typical tuberculous affection of the sheath of the left Achilles tendon, which had developed within a comparatively short time, was regularly subjected to hyperemic treatment by means of the elastic bandage around the thigh.

After four months he had gained almost 40 pounds, and had to change diet in order to reduce his weight. The neighborhood of the sinus was tender as before, also the opposite sacro-iliac articulation. Hyperemic treatment by means of suction glasses was now added. Regularly every day a large oval glass globe, covering the upper part of the os sacrum and both sacro-iliac articulations, including the immediate surroundings, was employed, suction for five or six minutes alternating with three-minute intermissions. Half a year later the sinus had closed for the fifth time. It reopened and healed temporarily in the course of the following two months. But since the spring of 1907 the scar has formed permanently, proving beyond a doubt that the local tuberculous bone disease had healed.

No better proof could be rendered for the existing depth effect of suction hyperemia.

Meanwhile pain and tenderness over the sacrovertebral joint and fifth lumbar vertebra itself had appeared. Slowly a large cold abscess developed in the right lumbar region, the opposite side to that originally evacuated.

It is very probable that the hyperemic treatment caused this breaking-down of the tuberculous infiltration, which, in the light of Bier's teachings, is to be looked upon as a favorable sign. Slowly the pus traveled downward along the iliopsoas muscle. When the patient came to the city for surgical treatment, in May, 1907, a typical large cold abscess could easily be made out above the upper half of Poupart's ligament. Its development could be explained in no other way than by assuming that the sacrovertebral articulation as well as the body of the fifth vertebra had become complicated in the disease. Typical clinical symptoms corroborated this diagnosis, which was also concurred in by a prominent orthopedic surgeon who was consulted at the request of the family.

On June 7th the abscess was tapped under local anesthesia. More than a quart of thin pus was evacuated through the trocar cannula, and 100 c.c. of a 5 per cent. sterilized iodoform glycerin emulsion injected in its place. Three weeks later the process had to be repeated; a great deal of the fluid had reaccumulated. Of course, the general treatment in all its details was strictly and regularly adhered to right along; also the hypodermic application of tuberculin (Béraneck's preparation), which had been begun several months before, was continued in increasing doses for twelve months. Furthermore, a leather corset supported by steel bands was procured. This was at first worn continuously, the only time of interruption being during massage and cupping. Later on the corset was left off at night. The abdominal posture was much favored by the patient. Early in July he returned to the mountains. When seen by me there in September, the abscess had refilled to such a small extent that aspirating, though I came prepared to do so, was not done, it being deemed wiser to trust to spontaneous absorption. At this time the bacilli in the sputum had entirely disappeared; in fact, it had been impossible, by the most careful search, to detect the same for over a year. But the patient complained of frequent accumulation of mucus in the throat and trachea. The regular use of Kuhn's lung suction mask was then added in the treatment of this case.

As is well known, this mask was designed for the purpose of subjecting the lungs to suction hyperemia, according to Bier's principles.

Faithfully the mask was used by the patient, who is impatiently waiting for the verdict "cured." The mask has been applied for one hour twice daily up to the present time. The accumulation of mucus and the slight hacking cough have disappeared.

The localized tuberculosis within the sheath of the left tendo Achillis also has completely subsided.

At the time of writing these lines the patient is in excellent condition. He has returned from the mountains. If no unforeseen setback occurs, the hope may be confidently entertained that another year, carefully spent with no other aim but to get well, will suffice to restore the patient to complete health.

Case II.—*Recurrent Tuberculous Inflammation of the Tibiotarsal Joint after Astragalectomy Combined with Extirpation of the Synovial Membrane. Cured by Means of Hyperemic Treatment.*

R. E. McM., male, sixteen years of age, consulted me in February, 1906, for a typical inflammation of the right tibiotarsal joint. Patient is a slim, tall, anemic young man. Father has phthisis. The *x*-ray shows a typically

diseased astragalus as the cause (sequestrum). In view of the rather limited means of the family and the excellent results obtainable in these cases by operation, conservative treatment was not favored. In February, 1906, the joint was opened according to Koenig's method. The astragalus was removed, the much diseased synovial membrane carefully extirpated, and a special incision added for drainage of the joint on the outside near the tendo Achillis. The three wounds were left wide open, and the cavity was filled with iodoform gauze. The first dressing remained undisturbed for two weeks.

Early in June the patient was discharged with his wounds closed and excellent motion. Still, he was not permitted as yet to use the extremity. Equipped with crutches and the elastic bandage, which he had learned to apply during the hyperemic after-treatment, he soon left for Colorado. He improved rapidly. Next spring found him horseback riding. He then (May), unfortunately, severely sprained his foot. Pain and tenderness set in, and several abundantly discharging sinuses resulted. He had moved to a camp in Wyoming. I sent him a set of suction cups and an elastic rubber bandage for hyperemic treatment of the foot, forbidding him to use the latter. Full directions were given and changed from time to time according to the course of the trouble. Six months later all wounds had closed, and the pain and tenderness subsided. He was again warned against putting any weight upon the foot for some time.

He is at the present time still using the artificial hyperemia.

A recurrent trouble like this would formerly have required prompt surgical attendance, several secondary operations might have become necessary, and, in case of a serious turn of the trouble, even amputation of the leg might have had to be resorted to. Fortunately, this patient, far removed from direct medical aid as he was, had sufficient intelligence to carry out properly the treatment on basis of directions given from New York.

This case represents another striking illustration of what fresh air in conjunction with careful and persistent hyperemic treatment can accomplish in a comparatively short time. It also demonstrates how careful a patient with a recently healed tuberculous trouble should be to avoid traumatism.

Case III.—*Tuberculosis of the Right Hip-joint, with Multiple Sinus Formation. Disarticulation at Hip-joint; Involvement of Pelvis; Alive after Ten Years' Outdoor Life. Hyperemic Suction Treatment for Persisting Sinuses; Steady Improvement.*

On November 8, 1897, I performed disarticulation at the right hip for a long-standing suppurative tuberculosis of the joint in F. B., a man, thirty-six years of age. He had seen many physicians and tried everything imaginable. The entire upper half of the femur was implicated in the disease, and the soft parts were riddled with discharging sinuses. Total removal of the lower extremity gave the only hope of relieving his condition. This was carried out with intra-abdominal compression of the common iliac, through an intramuscular incision, according to McBurney. The method worked admirably; there was very little loss of blood. Unfortunately, it was seen, after the acetabulum had been fully exposed following the removal of the

extremity, that the pelvis, too, was extensively invaded by the disease. The greatly run down, anemic condition of the patient forbade immediate additional resection of the os ilii. A few months later, when the patient had sufficiently recovered, this second operation was proposed to him, but he absolutely refused. He asked me what else he might do to prolong his life. I advised him to buy a place at the seashore, live there all the year around, and stay in the open air as much as possible. We had to select the seashore instead of the mountains, as the patient, being dependent on his business, wanted to go to the city regularly as long as his condition would permit.

I then lost track of him, and was greatly surprised when, in April of this year, I was requested by a colleague to see this patient with him in a Long Island seashore place. I had considered him long dead and gone. Instead, I found a still very anemic man, who, up to a few days ago, had gone to the city regularly winter and summer, attending to his business, having become quite prosperous. He wanted my advice regarding some pain he had in the region of the symphysis—a new feature in his trouble. In looking him over and comparing his present condition with that of ten years ago, I found that quite a number of sinuses had closed, while others still remained open, extending deeply into the pelvis. He had them packed day after day with yards of narrow strips of gauze by his faithful wife, who had tenderly nursed him all these many years. His lungs were not affected. Urinary examination showed absence of albumin.

I advised that the packing be stopped, and Bier's suction cups used instead, giving the necessary directions.

Again I deeply regretted our present inability to produce obstructive "*venous*" hyperemia, the kind that is required for the treatment of tuberculous affections in the bones of the pelvis and hip-joint.

To-day, three months later, the discharge from the sinuses has greatly decreased, his pains have disappeared, and his general health, too, is decidedly improving.

Pondering over this case, I have been much impressed by the salubrious effect of open air in what seemed to me an absolutely hopeless case.

These three were private patients of mine. They were able to spend money in an effort to regain their health. But how shall the masses—the hopelessly poor? No adult patient afflicted with chronic suppurative tuberculous bone disease, even with a very slightly discharging persistent sinus, can gain admission to any of our many country sanatoriums. The latter are thus far designed for internal tuberculous affections exclusively, viz., consumption, not for surgical cases. And how great an amount of good could be done, if provision were made by the State and by our wealthy philanthropists, to allow also these poor sufferers to obtain the benefit of this all-important remedy for them, "fresh air!"

I would, therefore, close my remarks with the plea that, for the present, two special wards—male and female—be set aside for surgical cases in all country sanatoriums for consumptives, and that the special position of surgical assistant be created. It is self-understood that such colleague would

have to be a man of hospital training and fully conversant with Bier's hyperemic treatment.

This arrangement would have to be continued until the State or philanthropists had separate sanatoriums erected *exclusively* for the conservative treatment of adults suffering from surgical tuberculosis. I plead for separate sanatoriums for the reason that the majority of these patients are not afflicted with complicating tuberculous affection of the lungs.

If a number of private rooms were set aside in such sanatoriums for surgical tuberculosis, the income derived from this source would be a material help in defraying running expenses.

El Aire Puro Combinado con el Tratamiento Hiperémico en los Casos Quirúrgicos de Tuberculosis de los Huesos en el Adulto.—(MEYER.)

La influencia benéfica del aire puro en los casos quirúrgicos de tuberculosis de los huesos es, en los niños, generalmente reconocida. No así en los adultos. En los últimos la operación radical ha sido el tratamiento, de costumbre hasta la fecha y probablemente continuará siéndolo, siempre que la economía de tiempo sea uno de los factores que deben tenerse en cuenta, ó cuando no haya suficientes medios á mano.

Las historias de tres casos complicados de tuberculosis de los huesos en adultos se muestran para demostrar cuanto puede alcanzarse aun en los casos que de costumbre se consideran tratables, especialmente si se combina con fieles y apropiados métodos de tratamiento hiperémico en sus diversas formas.

Se pide que en los sanatorios hoy designados para pacientes que sufren de tuberculosis pulmonar se dediquen dos salas, à lo menos, (para hombres y mujeres) para el tratamiento de los casos quirúrgicos de tuberculosis de los huesos en el adulto, que por razones varias, no podrían ó no deberían sujetarse á operación. Naturalmente los médicos de asistencia y enfermeras de estas salas, deberían dominar por completo todos los detalles del tratamiento hiperémico.

Du traitement par l'air frais combiné avec le traitement par l'hyperémie dans les cas chirurgicaux de tuberculose compliquée des os chez les adultes.—(MEYER.)

L'influence bienfaisante de l'air frais dans les cas chirurgicaux de tuberculose des os chez les enfants est généralement admise. Ce n'est pas ainsi chez les adultes. Ceux-ci ont été traités principalement par l'opération

radicale jusqu'à présent et continueront probablement à être traités de cette manière dans tous les cas où il faut épargner du temps, ou bien là où l'on ne dispose pas de moyens suffisants.

L'auteur cite trois cas de tuberculose chirurgicale compliquée des os chez des adultes, par lesquels il montre quels bons résultats on peut obtenir même dans les cas ordinairement réfractaires, surtout si l'air frais et combiné avec le traitement hypérémique, dans ses différentes formes, appliqué proprement et consciencieusement.

L'auteur demande que, dans les sanatoria qui maintenant sont destinés à recevoir les malades atteints de tuberculose pulmonaire, on pourvoie au moins deux divisions (pour hommes et pour femmes) où l'on soignerait les cas de tuberculose chirurgicale des os des adultes, que, pour une raison ou pour l'autre, on n'a pas pu opérer. Bien entendu, les médicins et les garde-malades de ces divisions doivent connaître parfaitement les détails du traitement hyperémique.

Frische Luft, combinirt mit Hyperämie, angewandt in der Behandlung complizirter chirurgischer Fälle von Knochentuberkulose bei Erwachsenen.—(MEYER.)

Der wohltätige Einfluss der frischen Luft in chirurgischen Fällen von Knochentuberkulose bei Kindern ist allgemein bekannt. Nicht so bei Erwachsenen. Bei den letzteren war die Radikal-Operation bisher die gewöhnliche Behandlung und wird es wahrscheinlich bleiben, wo immer Zeitersparnis als erwägenswerter Faktor in Betracht kommt, oder genügende Mittel nicht zur Hand sind.

Die Krankheitsgeschichten dreier Fälle von complizirter Knochentuberkulose bei Erwachsenen sind vorhanden, um zu beweisen, wieviel sogar in für gewöhnlich als nicht behandelbar geltenden Fällen getan werden kann, ganz besonders, wenn Combinationen der hyperämischen Behandlung in ihren verschiedenen Formen ordentlich und gründlich angewendet werden. Es ist der Vorschlag gemacht worden, in den jetzt für an Lungentuberkulose leidenden Patienten bestimmten Heilanstalten zum mindesten zwei Abteilungen (männlich und weiblich) für die Behandlung Erwachsener, an chirurgischer Knochentuberkulose Erkrankter, einzurichten, die aus verschiedenen Gründen sich einer Operation nicht unterziehen konnten oder wollten. Selbstverständlich sollen die in solchen Abteilungen angestellten Ärzte und Krankenpflegerinnen die Details der Hyperämie-Behandlung völlig beherrschen.

THE SURGICAL TREATMENT OF TUBERCULOUS SINUSES AND THEIR PREVENTION.

By Emil G. Beck, M.D.,
Surgeon to the North Chicago Hospital, Chicago.

The skill and wisdom of the medical profession have been taxed to the utmost in perfecting the method of treating suppurative sinuses, but their efforts have, until recently, not been entirely successful. As evidence of this fact we may point to the invalids who, for years, have received the most skilful treatment, and have submitted to repeated and often dangerous and mutilating operations, without having been materially benefited.

A confession of our inability to deal with this class of affections is the scant information which our best text-books give us on the treatment of this serious and prevalent ailment. The following quotation from the latest edition of Keen's "Surgery" is an example of the extent to which the therapy of this subject is treated:

"Tuberculous sinuses are troublesome because of their refusal to heal until all infective material has been removed, and sometimes this is impossible, even though the most serious and extensive operations are resorted to. As instances may be cited spinal caries, hip disease, and white swelling of the knee."

This is a sad commentary upon our fighting ability to cope with a malady so wide-spread and destructive, one which selects its victims from the poorer classes, who are least fortified to withstand the hardships which invalidism imposes, an ailment which keeps thousands of children in pain, confinement, and helplessness, and when it does not kill, often cripples for life. These unfortunate persons are likewise a source of danger to those who surround them, the tuberculous infection being spread by the secretions from their fistula.*

Meeting with failure, surgeons have naturally directed their efforts to prevention rather than cure. Since sinuses or fistula themselves are not diseases, their prevention must be sought in fighting the disease which causes them, and whenever this disease cannot be checked, such measures of treatment and prevention must be used as will guard against the formation of sinuses.

*Garre: Deutsche med. Wochenschrift, 1905, p. 47.

The terms sinus and fistula are often used interchangeably. In this paper the term "sinus" will refer to suppurative channels or tracts leading into blind pockets or cavities in bone or parenchymatous tissues, while the term "fistula" will apply to suppurative tracts leading to hollow organs.

We shall here consider the fistulous tracts and sinuses of tuberculous origin, only first reviewing the principal methods of their prevention and treatment now in vogue, and then discuss a new method of diagnosis, prevention, and treatment which I shall have the privilege of presenting to you.

The orthopedic surgeons have proved that, by rest, proper immobilization of the affected parts, and general treatment, tuberculous disease of the joints may be arrested, and in a large percentage of cases the patients restored to perfect health without any surgical interference. This form of treatment in itself is of great value in the prevention of sinuses. All cases, however, do not yield to this course of treatment, and some more radical measure is required. Injection into the joints of a 10 per cent. iodoform-glycerin emulsion, or a 1 to 5 per cent. solution of carbolic acid, and, lately, the formalin-glycerin solution, advocated by Dr. John B. Murphy, have been found effective in destroying the tuberculous process and restoring the limb to comparative usefulness. Where the disease has destroyed the synovia, perforated the cartilage, or where the epiphyses are the seat of tuberculous disease, still more radical surgery is necessary, such as either the erasion or resection of the joint, as the case may require. In extreme cases an imputation is sometimes necessary in order to save the patient's life.

The more recent advances, such as Professor Bier's hyperemia treatment, the application of *x*-rays, and lately the subcutaneous injections of Koch's tuberculin, under the guidance of the opsonic index, have their advocates in the treatment of tuberculous joints, and although their value has not yet been definitely determined, they must, nevertheless, be considered as very important factors in the indirect prevention of tuberculous sinuses. With the methods here enumerated most cases will recover. Some cases, however, will resist all efforts to prevent abscess formation.

Even though an abscess has formed, the sinus can still be prevented. By rest in bed the abscess may disappear by absorption. Its incision and drainage have heretofore been discouraged, on account of the danger of secondary infection which usually follows. In many instances, however, the abscess ruptures spontaneously, and a sinus or fistula is inevitable. After the sinus has once formed and there is no natural tendency to spontaneous closure, it will persist in discharging pus indefinitely.

The irrigation of fistulous tracts or abscess cavities with solutions, such as the silver salts or iodin, olive oil with turpentine, permanganate of potash, and various other solutions, which at one time was the routine treatment of these affections, has now been discarded by all progressive surgeons, and

Fig. 1.—Network of tuberculous sinuses undermining the muscles of the back. E Opening of fistula.

Fig. 2.—Sinuses resulting from tuberculous spondylitis. E, Fistulous opening.

those who have had the widest experience with this class of cases have concluded that, aside from the prophylactic, hygienic, and dietetic treatment, surgery is the only means which has been to any degree effective in curing tuberculous sinuses. However, even here surgery has a limited field. It will fail where the fistula cannot be traced to its origin and be completely eradicated. Unfortunately, this is often the case, because the sinus often leads into inaccessible regions, such as the sinuses following tuberculous spondylitis. Again, the sinuses are often so extensive and undermine such large areas that their extent cannot be estimated. A successful surgical operation depends upon a correct anatomical diagnosis. In no other affection is this more important than in the operative treatment of fistulous tracts.

Anatomical Diagnosis.—June 13, 1906, I demonstrated before the Chicago Medical Society a new method of anatomical diagnosis of fistulous tracts, advised by my brother, Dr. Carl Beck. This method consists of filling the fistulous tract or abscess cavity with a paste made of 33 per cent. bismuth subnitrate and 66 per cent. of vaselin, and then taking a radiograph of the region so injected. This paste is liquefied by heating before injection, and it requires only moderate pressure to force the liquid into all recesses of the sinus.

It is well known that bismuth offers great resistance to the penetration of the *x*-ray, and, therefore, it is a suitable material for this class of radiographic work. A radiograph taken by this method clearly shows the boundaries of the fistulous tracts or cavities, tracing distinctly the ramifications of the same, no matter how extensive and tortuous they may be. Stereoscopic radiographs are still more valuable, as they inform us of the depth and relation of sinuses to other structures. The most unexpected and surprising findings are often thus obtained. (See Figs. 1 and 2.) In cases where repeated surgical operations have failed to effect a cure, these radiographs have disclosed the cause of the failure. They demonstrate that the surgeon's incorrect anatomical diagnosis was the cause of the failure, many ramifications having been left unexplored after what he considered a radical operation had been performed. With but limited means for exploration, then, at the disposal of the surgeon, this was not surprising. The probe, which was generally used, is unreliable, for obvious reasons. It may slip into one straight sinus, and cause us to conclude that this is the only one existing, while, in fact, the area may be undermined by a network of sinuses.

The staining of fistulous tracts by the injection of colored fluids, such as methylene-blue, for a guide during the operation, is likewise unreliable. The stain may run through only one large patulous sinus, the narrow ones remaining collapsed, owing to insufficient pressure to distend them. Moreover, the stained tracts become very much discolored by blood during the operation, so that they cannot be traced. Neither can one study the extent

of the disease before the operation. The sinus may extend into inaccessible regions, and this fact may not be discovered until the patient has been on the operating table for an hour or two.

The employment of peroxid of hydrogen for diagnostic purposes has no other value than to aid us in ascertaining whether a fistula communicates with a hollow organ or with another fistula.

By our new method, if properly carried out, it is almost impossible to miss any of the sinuses. We have a picture of the entire diseased tract before our eyes, and are thereby enabled to discriminate between operable and inoperable cases, whereas formerly we had to first perform the operation in order to find out whether the case was operable or not.

Eliminating the inoperable cases with the aid of this new method, and selecting one which is operable, a well-known surgical principle must be carried out in order to effect a cure, namely, the thorough eradication of all diseased tracts and tissues. Caries of bone or tuberculous granulation must be cureted or excised, so that the diseased tract is converted into a healthy wound, which should heal by healthy granulations. The healing of bone defects created by cureting has been aided by filling them with foreign substances. Filling such a cavity with a sponge in the hope that it might serve as a framework for bony growth was once practised, but has properly been given up. Later a method of filling the cavity with a blood-clot (Schede) was introduced. This, however, was applicable only in cases where the cavity could be perfectly sterilized, and for this reason its application was very limited. Another method which has some advantage over the blood-clot is that of filling the cavity with decalcified bone-chips, advocated by the late Professor Senn. In selected cases Neuber's method may be employed, which consists in removing a portion of the cortical bone shell surrounding the cavity and then inverting skin-flaps from either side, for the purpose of lining and obliterating the cavity. The Mosetig-Moorhof "Plombirung" has become a favorite method in obliterating these bony defects. It consists in sterilizing and drying out the bone cavity and then pouring in a heated mixture of iodoform, spermaceti, and oil of sesame, which solidifies on cooling. The soft structures are then sutured over this waxy plug, and primary union and cure often follow. Other substances, such as gutta-percha, plaster-of-Paris, filigree silver wire, have been used, mostly in experimental work.

Rectal fistulas are usually treated by slitting them into the rectum, cureting all accessible branches, and then allowing them to heal by granulation.

There remains a class of cases which will yield to none of these methods, neither prophylactic nor curative, namely, the sinuses extending into inaccessible regions. These individuals are a nightmare to the surgeon, a touching sight to the public, and a burden to themselves.

The new method of treatment which we wish to present for your consideration is applicable to practically all cases of this dreadful affection, including even those cases which have heretofore been considered hopeless. I refer to the injection of bismuth-vaselin paste for therapeutic purposes. This paste, which we at first used for diagnostic purposes only, has now proved to be of the greatest value in the treatment of tuberculous sinuses and abscess cavities. The extent of its value was not fully appreciated until August, 1907, when we noticed that patients on whom we employed the injection for diagnostic purposes returned to us after months entirely cured. This at once suggested to me the use of the bismuth-vaselin paste for curative effects, whereupon a number of obstinate cases were at once injected, and in each case the result was most gratifying, namely, a rapid closure of the sinuses.

On January 15, 1908, I reported 14 cases to the Chicago Medical Society, all treated by this method, 10 of which were then demonstrated.

This series consisted of two cases of spondylitis and psoas abscess, one of two years' and one of sixteen years' duration. Two cases of tuberculous hip-joint, one of nine years' and one of sixteen years' duration. One case of tuberculous knee-joint, seven years' duration. One case of tuberculosis of pelvic bones of three years' duration. One case of tuberculosis of the ulna of six months' duration. One case of fistula after removal of tuberculous kidney of one year's duration. Three cases of rectal fistula, one of two years', one of one year's, and one of six months' duration. Two cases of abdominal fistula following laparotomy, one of four months' and one of one year's duration. One case of tuberculosis of metacarpal bone, one year's duration.

Of these 14 cases, 10 had then been cured, 2 improved, and 2 not improved. Since that time 3 of the latter have healed entirely, so that only 1 case of this series remains uncured. This case (No. 1, Table H, Series 3) is a tuberculous spondylitis of sixteen years' duration, with nine discharging sinuses and several sequestra. The patient has thus far received 130 injections and is somewhat improved.

This method has since been tested by many of our noted surgeons, and their reports indicate that they have obtained equally good results.

It is my intention to present to this Congress a collective report of cases treated by this method, the records of which I shall obtain through the courtesy of the larger general hospitals, the United States Army and Navy Hospitals, and private practitioners. At this writing (July 20th) it is, however, too early to have obtained these reports. I have, therefore, concluded, for the present, to report only three series of cases treated in various Chicago institutions. The summary is as follows:

SERIES 1.—AUGUSTANA HOSPITAL, CHICAGO. REPORT OF DRS. A. J. AND E. H. OCHSNER.

TABLE A.—Number of cases cured	8
TABLE B.—Number of cases still under treatment	9*
	17

SERIES 2.—HOME FOR DESTITUTE AND CRIPPLED CHILDREN, CHICAGO. REPORT BY DRS. RIDLON AND BLANCHARD.

TABLE C.—Number of cases cured	9
TABLE D.—Number of cases cured by prophylactic method	2
TABLE E.—Number of cases still under treatment	13†
	24

SERIES 3.—NORTH CHICAGO HOSPITAL, CHICAGO. REPORT BY DRS. CARL, JOSEPH C., AND EMIL G. BECK.

TABLE F.—Number of cases cured	26
TABLE G.—Number of cases treated by prophylactic method	6‡
TABLE H.—Number of cases still under treatment	10§
	42

TOTAL.—	Cases cured by bismuth injections	43	60 per cent.
	Cases cured by prophylactic method	7	
	Cases improved	22	26.5 per cent.
	Cases treated one week, results awaited	5	6 per cent.
	Cases not improved	6	7.5 per cent.
		83	

For illustration of the method and its results, three typical cases are here cited, each exemplifying a different type of tuberculous sinuses:

SERIES 3, TABLE F.—CASE 2.—M. Y., aged fourteen, born in Germany; lived there until 1903; family history negative. He was healthy until he was seven years old, when he developed a painful swelling in his right knee. A cast was put on by his family physician for the purpose of immobilization. In a short time an abscess ruptured, the boy was transferred to the hospital at Freiburg, in Germany, and an operation was performed for tuberculosis of the knee-joint. He left the hospital seven weeks later with a sinus extending from the knee-joint into the middle of the tibia, and two smaller ones near the joint.

A short time later he returned to the hospital for another operation, which, however, failed to close the sinuses, and a third operation was performed two months later, again with an unfavorable result. The parents then took the boy to Tübingen, where Professor Bruns performed the fourth operation. No improvement, however, resulted, and three fistulas persisted as before. The family then moved to America, in June, 1903. They had abandoned all medical treatment; nothing more than daily dressing was done by the patient himself.

* Of the 9, 7 are improved and 2 unchanged.

† Of the 13 cases, 5 are improved; 5 have been treated only one week, results awaited; 3 are unchanged.

‡ Of the 6 cases, 5 are cured and 1 is improved, results being awaited.

§ Of the 10 cases, 6 show marked improvement, 3 some improvement, 1 remains unchanged.

Fig. 3.—Tuberculous knee-joint, six months after healing. Small quantities of bismuth still present

Fig. 5.—Tuberculous rectal fistula. A, External opening. B, Branch of fistula. C, Narrow channel connecting the two.

On March 21, 1907, at the age of thirteen, six years after the commencement of the fistula, he came to me for treatment. A radiograph without bismuth injection was first taken. It shows the joint and the epiphyses of femur and tibia nearly destroyed, and a sequestrum is clearly visible in the tibia. I proposed an operation, namely, the resection of the knee-joint, which was refused. I then decided on the next best procedure, and cleaned out the knee-joint, removing the sequestrum as radically as possible. This was done March 29, 1907, with the same result, namely, three fistulas persisted. I then decided to try Professor Bier's hyperemia method, which was carried out for four months, but without result. By this time our experiments with bismuth injections were so promising that I decided to try it in this case for therapeutical purposes.

The first bismuth paste injection was made October 3, 1907, and fistula at once showed the tendency to healing. After three injections, at intervals of one week, the sinuses became nearly closed, and I could only with difficulty make the fourth injection, of which I took a radiograph (Fig. 3). Since that time all fistulas remained healed, the boy became stronger, the pain entirely disappeared, so that he could discard his crutches, which he had used for seven years. He can now skip up and down stairs on the tuberculous limb. His weight has increased fifteen pounds.

Case 21.—Miss M. W., aged thirteen years, was well until her seventh year, when she fell, striking her hip. No serious consequences were discovered until 1904, when she was taken to St. Joseph's Hospital in Chicago, where the late Professor Senn diagnosed her case as tuberculosis of the hip; injected a 10 per cent. iodoform-glycerin emulsion, and put the limb into a plaster-of-Paris cast. Three months later the cast was removed, and from that time the injections were repeated until nine had been given. An abscess formed, which ruptured on the external side of her thigh, near the middle of the femur. The sinus resulting therefrom kept on discharging a large quantity of green, malodorous pus for three years, and required daily dressings. She was unable to move about without the aid of crutches, owing to the tenderness in her hip.

On February 28, 1908, when we first saw her, she was very much emaciated, pale and weak, with a shortening of 9 cm. in her left lower limb, and a sinus on the anterior surface of her left thigh, discharging pus, was found.

A radiograph taken demonstrated the destruction of the head of the femur. A second stereoscopic radiograph (Fig. 4), taken after the first bismuth paste injection had been given, demonstrated that the sinus extended from the opening on her thigh upward in front of the greater trochanter, winding its way backward toward the acetabulum, and there filling a small cavity in front of the ramus of the ischium.

The discharge diminished after the first injection, and its character was changed to a scropurulent fluid resembling dirty water. Repeated microscopical examinations of the pus discharge proved the gradual disappearance of the staphylococci and streptococci, which, before the injections were given, were found in abundance. After twenty injections during a period of four months the sinus healed.

Case 7.—J. P., aged eighteen. Family history: Father and mother living and well; three sisters and two brothers well; one sister died from bronchial trouble; one baby sister from tuberculosis.

Past history: About a year ago he had chills, fever, and pain about the rectum. An abscess formed and broke at a point one inch from the anus. Sinus persisted up to the time of examination. Operation was performed May 10, 1906. The sinus was slit open into the rectum, all visible recesses were thoroughly cureted and packed with iodoform gauze. After-treatment consisted of daily irrigation with boric acid and cauterization with 20 per cent. silver nitrate, but fistula showed no tendency to heal.

Bismuth paste was then injected into the sinus for diagnostic purposes only (Fig. 5). This clearly demonstrated why we had no success in the first operation, because another sinus existed higher up, which communicated by a constriction with the fistula operated upon. Another operation was at once decided upon and performed on July 7, 1906, and the sinus, extending about two inches in the direction of the prostate, was cureted. From this time on the healing went on rapidly. Patient slept out-of-doors, gained about twenty pounds in weight, and was discharged cured by September 7, 1906, and has remained so up to date.

Technic.

The technic is as follows: Two different preparations of bismuth paste are used, each having a different melting-point.

No. 1 consists of:

Bismuth subnitrate	33 per cent.
Vaselin (petrolatum)	67 "

This preparation is used for diagnostic purposes and the early part of the treatment.

No. 2 contains:

Bismuth subnitrate	30 per cent.
White wax	5 "
Paraffin (120° melting-point)	5 "
Vaselin (petrolatum)	60 "

The latter formula is used in the later part of the treatment, where it is desired to retain the paste within the sinuses, and where there is no danger of producing retention of pus by obstructing narrow connecting channels.

These preparations may be modified to suit individual cases. They may be made firmer and of a higher melting-point by increasing the proportion of wax and paraffin. At times it is advisable to use a smaller percentage of bismuth.

The vaselin, wax, and paraffin are sterilized by boiling, and the bismuth subnitrate gradually stirred in after the mixture has been removed from the fire. This will produce a yellow, homogeneous liquid, which, on cooling, will form two layers. The heavier bismuth will gravitate and leave a layer of vaselin on the surface. It is therefore necessary to heat and stir the mixture before using. Accidental admixture of water during the preparation will destroy the homogeneous quality and interfere with its retention within the sinuses.

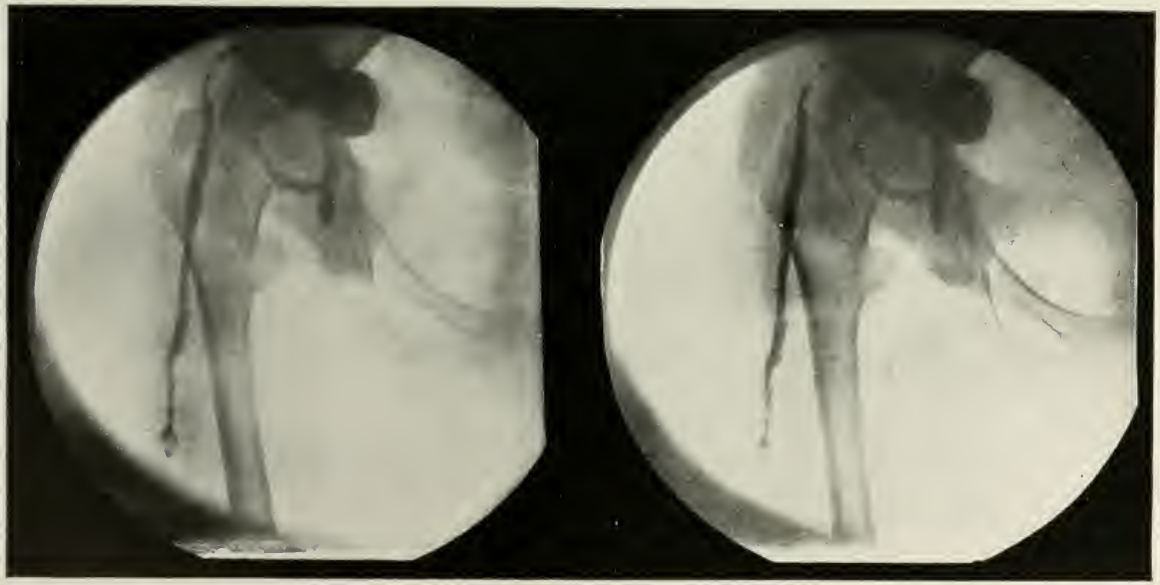


Fig. 4.—Stereoscopic radiograph of bismuth injection into tuberculous hip-joint.

Instruments.

The only instrument used is a glass syringe with a pointed nozle, similar to the urethral syringes. Fig. No. 6 is that of a syringe which we have used with satisfaction. It can be obtained in several sizes, and some modifications to suit different cases.

Preparation and Injection of Sinuses.

Originally we attempted drying the fistula by means of gauze strips, before injection, but we have now discontinued doing this, having found it entirely superfluous. We cleanse the opening of the fistula with 95 per cent. alcohol, press the nozle of the charged syringe against the opening, and, under moderate pressure, slowly force a quantity of the paste into the fistula until the patient begins to complain of pressure. The syringe is then

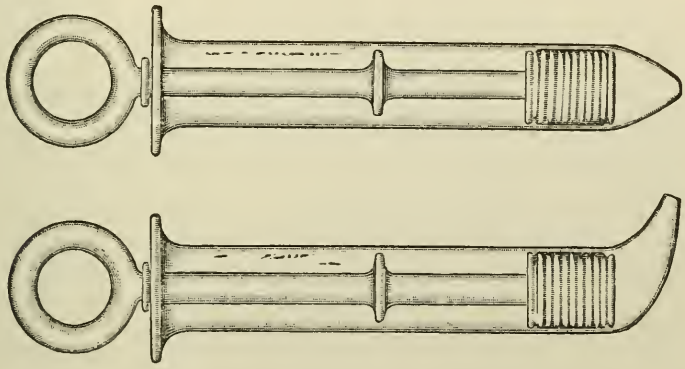


Fig. 6.

removed, and a pledget of gauze quickly pressed against the opening, and held there until the paste has sufficiently set, thus preventing its escape. To hasten this an ice-bag may be applied to the region injected. The patient remains quiet for several hours after the injection.

There is no definite rule as to the frequency of these injections. One must be guided entirely by the symptoms which follow the first injection. Cases discharging pus for years have been permanently healed by one single injection, while other cases have required repeated injections, at intervals of from five to ten days, to produce a gradual improvement. It is advisable to wait at least one week after first injection.

One rule, however, may be adhered to; that is, if the first injection of bismuth paste remains in the sinus, it does not require reinjection.

The manifestations following these injections are manifold. First of all, they are *painless*. At the Home for Crippled Children in Chicago, where I

often injected 15 cases in one ward at one time, the children regarded the procedure as a sort of entertainment, and looked forward to my semi-weekly visits with great anticipation.

Hemorrhage has not followed in any case. Slight oozing of blood from large granulating surfaces was observed in a few cases, usually due to the distention of the sinus, or from mechanical irritation by the tip of the syringe.

Sepsis has not followed in any case treated by us, although we have frequently noted elevation of temperature following injection. As a rule, the rise would not be above 103° F., and usually subsided in twenty-four to forty-eight hours. This elevation of temperature is due to retention of pus in some recess, or to a reaction. The melting-point of the paste No. 2 is adjusted so that it will melt by the fever heat of the body, and in that way automatically release the accumulation of pus. Very often there is no escape of pus, and temperature subsides spontaneously. This phenomenon will be explained later, when the bacteriology of the bismuth injections is considered.

Many interesting facts have been observed during the development of this method, but the length of time since its inception does not warrant us in drawing broad and definite conclusions. We desire, however, to put on record our observations as we have noted them.

The question as to what becomes of the bismuth after injection, we have, I believe, solved satisfactorily. In most cases portions of it will be found in the dressings within twenty-four hours after injection; in others, where the sinuses are deep and tortuous, the bismuth paste will remain in them for days and even weeks, and frequently it will heal in and become encapsulated and gradually be absorbed.

In body cavities the absorption of the bismuth is preceded by organization of the mass by connective tissue. An exception to this has been noted by Dr. Joseph C. Beck in a case of empyema of the antrum of Highmore, when, after complete healing with the bismuth method, the cavity could be demonstrated by means of a probe as well as by transillumination. In cavities with resilient walls, such as the pleural cavity, the gradual expansion of the lung will reoccupy the space resulting from the absorbing bismuth paste. This assertion may be proved, first, by radiographs taken at certain intervals; second, by physical examination of the patient; third, by microscopical examination of the tissues.

The absorption of the bismuth is well illustrated in a case of lung abscess (Series 3, Table F, Case No. 3) treated and cured by this method. Patient was presented before the Illinois State Medical Society May 20,1908. The three radiographs taken at definite intervals demonstrate the gradual disappearance of the bismuth from the chest cavity. Fig. 7 was taken after

Fig. 7.—A, Abscess cavity filled with bismuth.

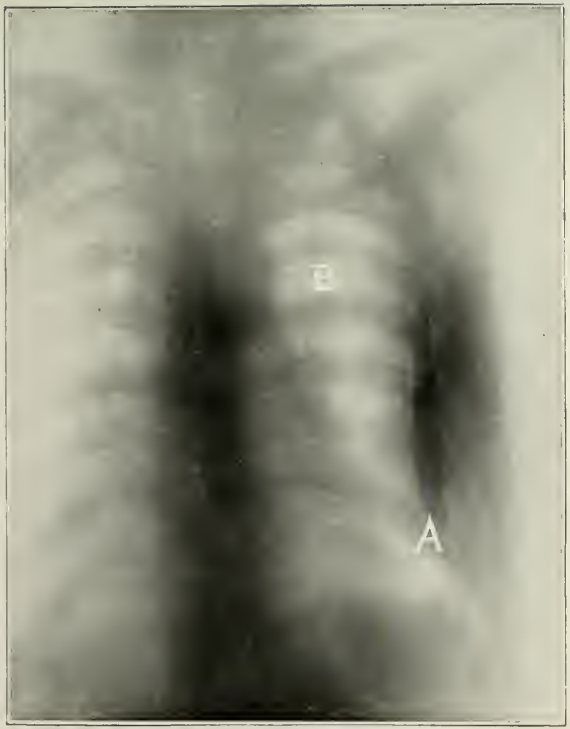


Fig. 8.—A, Bismuth remaining two months after closure. B, Clearing of lung.

Fig. 9.—C, Remaining traces of bismuth four month after closure.

Three stages of absorption of bismuth in lung abscess. Series 3, Table F, Case 3.

Fig. 10.—Bismuth paste injected into muscle of guinea-pig.

Fig. 11.—Bismuth paste injected into peritoneal cavity of guinea-pig.

the last (tenth) injection, January 8, 1908, and demonstrates that the cavity is nearly obliterated by the paste. Fig. 8 was taken two months later, and demonstrates the absorption of the paste to one-quarter of its original size. Fig. 9, taken four months after the last injection, demonstrates that only small traces of bismuth paste are present, and that the portion of the lung which before the injection was dense, due to the presence of the abscess, is now perfectly clear. The physical examination of the patient coincides with the findings of the last radiographs. The chest, which was considerably retracted, is now nearly equal in size to the opposite side, and perfect resonance and vesicular breathing are present.

The response of living tissues to the injection of bismuth paste was studied on guinea-pigs. The animals were injected subcutaneously, intramuscularly (Fig. 10), and intraperitoneally (Fig. 11) with bismuth paste, and four weeks later microscopical sections prepared.

Postmortem findings showed that the paste injected intramuscularly and subcutaneously became encapsulated. In the peritoneal cavity it was found loosely embedded in its recesses, and in only a few places was it found adherent to the peritoneum.

Microscopical examination of sections obtained from intramuscular injections shows that the border of bismuth crystals is infiltrated with round-cells. The spaces between the individual crystals are closely packed with these young connective-tissue cells (Figs. 12 and 13). The border-line between the muscle and bismuth consists of several strata of elongated connective-tissue cells forming concentric layers, in some places merging into fibrous bands encircling the bismuth plug. Just outside of this layer we find a large number of irregularly arranged, shorter and longer, spindle-shaped cells, which in places invade the interstices of the adjacent muscular tissue.

These findings demonstrate that when bismuth-vaselin paste is injected into healthy muscle, it will be permeated with fibroblasts and completely encapsulated by connective tissue. Whether the same process takes place in chronic suppurative cavities after the bismuth paste has healed in is a matter which will be determined as soon as specimens for examination can be obtained. Whatever the histological findings may be, the absorption of bismuth stands proved by radiographs.

Regeneration of bone in cavities filled with the Moorhof iodoform plug has been proved by Silbermark.* He traces the progressive development of bone, and shows that it replaces the gradually disappearing iodoform plug.

It was formerly questioned whether bismuth subnitrate is absorbed in the alimentary canal, but it is now definitely proved that it is slowly absorbed and slowly eliminated.

* Silbermark: Deut. Zeit. f. Chir., 1904.

Harnack* affirms that after bismuth administration the former is found in the liver, spleen, urine, mother's milk. E. S. Wood,† in our own country, detected bismuth in the urine four weeks after the last ingestion.

Having ascertained that bismuth is absorbed, even from dense-walled sinuses, the practical question arises: Is the continuous absorption of bismuth harmful? Although nearly every physician prescribes bismuth for digestive disorders, we hear little of bismuth poisoning. Radiographers give large quantities by stomach, for the purpose of obtaining roentgenograms of the digestive organs. Rieder‡ prepares a bismuth meal, which contains 40 grams of bismuth subnitrate, and states that he has noticed no ill effects therefrom.

In the literature, however, we find authentic records of bismuth poisoning. Professor Kocher,§ who used bismuth subnitrate for antiseptic dressings during surgical operations, reported in 1882 several cases of poisoning which he attributed to the use of bismuth subnitrate. Peterson‖ also reports a case of poisoning, brought about by rubbing bismuth powder into the ends of a resected joint. A more recent report is that of Dressman** and Muhling,†† of three cases of bismuth poisoning due to the application of a bismuth salve. The symptoms noted were acute stomatitis, with a peculiar black border around the teeth, a dark discoloration of the mucous membrane, intestinal catarrh, and desquamative nephritis. These reports should put us on our guard, since they come from reliable observers.

In our experience of more than two years with bismuth injections we have not met with any true case of poisoning, such as described by the authors just quoted, although we have noted in some cases where larger quantities were injected a lividity of the skin and mucous membranes. In one case, where 300 grams of a 33 per cent. bismuth paste was injected into the pleural cavity and retained there for four weeks, we observed this lividity and noted that the patient lost ten pounds in weight, had a small amount of albumin, and a considerable number of epithelial cells in the urine. Examination of blood showed 4,416,000 red blood-corpuscles and 10,000 leukocytes, of which 18 per cent. were lymphocytes, 23 per cent. mononuclear leukocytes, 58 per cent. polymorphonuclear leukocytes, 1 per cent. eosinophiles, hemoglobin 80 per cent. No crystals of bismuth found in the blood. The bismuth paste was at once dissolved by injecting heated olive oil, withdrawn by Bier's suction pump; the symptoms gradually subsided, and the case progressed favorably.

* Harnack: Arzneimittellehre, 1883, p. 383.
† E. S. Wood: Trans. American Neur. Assoc., 183, p. 23.
‡ Archives of Roentgen Ray, No. 87, October, 1907.
§ Volkmann's klin. Vorträge, No. 224. ‖ Deut. med. Woch., June 20, 1883.
** Münch. med. Woch., February, 1901. †† Münch. med. Woch., 1901.

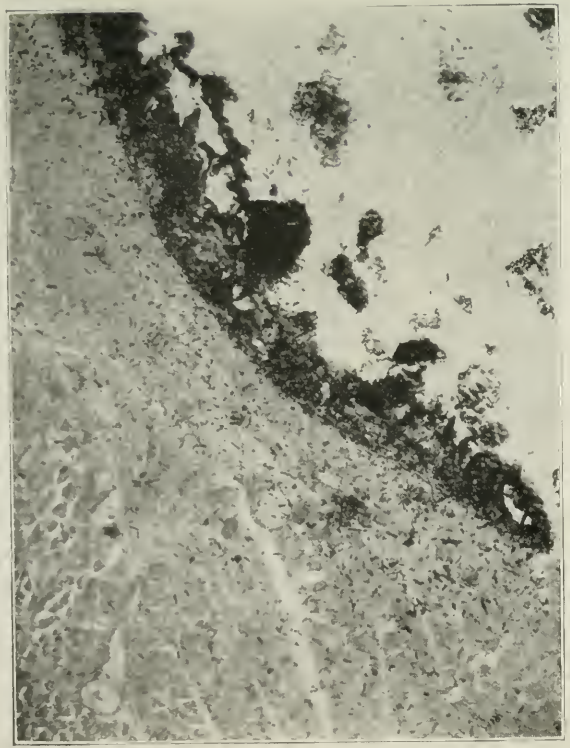


Fig. 12.—Microscopical section of intramuscular injection of bismuth paste.

Fig. 13.—High power.

We have also received a report of a case from a physician which bears all symptoms of bismuth intoxication.

A gentleman, fifty-seven years old, poor in health, had suffered from tuberculosis of his hip-joint since 1896, and after two extensive operations retained a fistula. Twenty injections of bismuth—a total quantity of about one pound of bismuth subnitrate—were given from March 18 until May 19, 1908. About that time he developed stomatitis, dark discoloration of the gums, black border around the teeth, diarrhea, great thirst, and desquamative nephritis. Symptoms have, however, abated, and his fistula has closed entirely.

From the history in this case and from the literature we must admit that there is a possibility of intoxication from absorption of the bismuth injected into sinuses or abscess cavities. We must not be deceived by the fact that large doses administered by stomach will cause no ill effects. There is a vast difference between the two methods of administration. Administered by stomach, there is little chance for absorption, as it passes through the alimentary canal in twenty-four hours, and bismuth is known to be slowly absorbed. Injected, however, into the pleural cavity or psoas abscess, it is retained for weeks, and its absorption may cause an accumulative effect.

We have, however, several cases on record in which 100 grams of paste injected into the cavity remained there until entirely absorbed without causing any symptoms of bismuth intoxication. On the contrary, it had a very salutary effect on most patients. Nearly all kept on gaining in weight. The same experience is reported to us by surgeons who have had considerable experience with it. Nevertheless, we advise conservatism in administering large doses of bismuth paste and a constant watchfulness for symptoms enumerated. We would not advise the injection of more than 100 grams of the 33 per cent. paste. If larger quantities are required, reduce the percentage of bismuth. This rule should be adhered to at least until the possibility of bismuth intoxication is excluded.

Having ascertained that the absorption of small quantities of bismuth is harmless, we proceed to the study of the factors which produce the rapid improvement in these very resistant affections. The most potent one appears to be the bactericidal factor. In the beginning we somewhat underestimated the bactericidal action of bismuth subnitrate, but with our growing experience we believe it will be difficult to find another substance which in the form of paste possesses as many qualities essential to healing processes. Its action is bactericidal and astringent; it is slowly absorbed, and in moderate quantities non-toxic.

Its antiseptic quality has been tested by Professor Kocher and Professor Peterson in 1882. We have investigated its bactericidal action by systematic examination of the secretions from suppurating sinuses while under

the bismuth treatment, and have invariably found a continuous decrease in the number of microörganisms, and in many cases their final disappearance.

Tubercle bacilli are no exception to this rule. This fact was discovered in a case of tuberculous empyema (Case No. 10, Table H, Series 3) in which tubercle bacilli were found abundantly in the pus from the pleural cavity previous to the injection of bismuth. After the injection their number gradually diminished, and in five weeks they could not be found by microscopical examination. For illustration I cite this interesting case:

B. H., aged twenty-three, law student, with negative family history as to tuberculosis, developed a pleurisy with effusion in his right chest in January, 1906. In May, 1906, the chest was aspirated three times in five days; each time a large quantity of clear fluid was withdrawn. His chest, however, continued to refill and was periodically aspirated. At the ninth aspiration 1200 c.c. of turbid fluid were removed. September 20, 1906, he went to Denver, where his chest was again aspirated three times by Dr. Bonney, who reported that tubercle bacilli were found in the fluid withdrawn. On his return to Chicago in November, 1906, he consulted Dr. J. B. Herrick, his diagnosis likewise being tuberculous pleurisy with effusion.

On December 5, 1906, an operation was performed by Drs. Danby, Hubbard, and Grosh, in Toledo, which consisted in the resection of five ribs, the removal of a large amount of fibrinous lymph, and establishment of drainage. The large cavity was irrigated daily with 0.5 per cent. of iodin solution during his seven weeks' stay at the hospital, and thereafter continued at home. With the above history, he was referred to me by Dr. Herrick for the bismuth treatment.

Physical examination revealed a hyperresonance over his entire right chest. A fistulous opening discharging a dark green pus was in the center of an eczematous area, about two inches below the nipple, internal to the axillary line. Smear preparations from the pus revealed the presence of tubercle bacilli, 5 to 15 to each *immersion* field, and a moderate number of staphylococci.

A radiograph (Fig. 14) clearly shows the size of the cavity when empty, and another (Fig. 15) when injected to its full capacity with 620 grams of 33 per cent. bismuth paste. The drainage-tube was at once left out, and the patient allowed to be outdoors. Every day or two thereafter the accumulation of pus was withdrawn by means of a glass tube and examined microscopically. Each time we noticed a diminution in the number of tubercle bacilli, and after eight weeks their final disappearance. The staphylococci had likewise disappeared. We also noticed that the tubercle bacilli which were found after the bismuth had been injected had lost their characteristic shape. They became granular, beaded, and took the fuchsin stain more readily (Figs. 19 and 20).

Microscopical slides were submitted at different periods to Dr. Maximilian Herzog and Dr. A. Gehrman, bacteriologists, whose reports coincided with our findings.

Eight guinea-pigs were injected with the pus discharged during the period of treatment of this case. Animal No. 4 was injected April 24th with 10 drops of a 10 per cent. solution of the pus taken from the chest before the

Fig. 14.—Tuberculous empyema pleuræ before bismuth paste injection.

Fig. 15.—Same case as Fig. 14 after bismuth paste injection. Series 3, Table II, Case 10.

bismuth treatment was instituted. Animal developed general tuberculosis, and died six weeks later, showing tuberculosis of all parenchymatous organs and glands.

Animal No. 9 was injected May 1st, exactly like No. 4, died June 24th. Liver, lungs and spleen tuberculous.

Animal No. 13 injected May 15th, same as No. 4. Killed July 15th. The report of findings by Dr. M. Herzog is as follows:

"Post-mortem examination of the guinea-pig No. 13, received alive July 10th, and killed July 15, 1908, showed caseous enlarged axillary lymph-glands on both sides, caseous enlarged inguinal lymph-glands of the right side. Very small young tubercles in the liver and spleen. Smears from these organs showed numerous typical tubercle bacilli.

"Animal No. 16: Baby guinea-pig, weighing 240 grams. Was injected June 7th with 150 drops of a 10 per cent. solution of pus from chest cavity. The animal has grown steadily, weighing 360 grams, and is very lively, but developed two lymph-glands under the right axilla, which drained the injected point. One of the glands was excised for examination, and report of same is as follows:

"Sections of the gland of G. P. No. 16, stained by various methods, show young, not very much degenerated, tubercles, with a moderate number of tubercle bacilli."

To test the toxicity of the discharge two guinea-pigs were injected, one which had been infected previously with tuberculous sputum, and another perfectly healthy pig. Each received an injection of 15 c.c. of the discharge (not diluted) intraperitoneally, and both appeared well for three days, but were found dead on the fourth day. Post-mortem revealed acute peritonitis in both animals.

Animal No. 21 was injected with 10 drops of a 10 per cent. dilution July 18th, and will be kept for further observation.

From these experiments we conclude that while the tubercle bacilli cannot be detected by the microscope soon after the institution of the bismuth treatment, the discharge must still contain some bodies to produce tuberculous disease in guinea-pigs, but the development of the disease is much slower, and symptoms much milder in the animals last injected, which proves that the number of tubercle bacilli, as well as their virulence, diminishes as the treatment of the patient progresses.

Another case of tuberculous empyema now under treatment with bismuth paste injection presents some interesting features which I desire to put on record:

Mr. W. J. E., thirty-seven years old; lawyer, with a family history free from tuberculosis, had scarlet fever and whooping-cough in childhood, measles at twenty, and angioneurotic edema at thirty. Was always considered healthy.

In December, 1907, he was attacked with pain in his left chest, which was diagnosed as pleurisy with effusion. The diagnosis was confirmed when, on January 29, 1908, 1500 c.c. of cloudy fluid was withdrawn. The opening was enlarged, and drainage-tube inserted by physician in charge.

Eight weeks later the drainage-tube was removed, and opening allowed to close. Patient began to cough, his temperature rose, whereupon the drainage-tube was reinserted, and in this condition he was sent to Arizona. He remained there three weeks, and although he gained some in weight, his temperature rose every evening to 102° or 103° F., his pulse from 100 to 110, cough was aggravated, but no sputum could be raised. The wound was dressed twice daily on account of the profuse and irritating discharge.

I saw him first on June 13, 1908. He was pale, emaciated, weighing 130 pounds, which was twenty pounds below his usual weight. He complained of weakness and pain in his chest; temperature was 100½° F., pulse 105, coughed considerable. The drainage-tube was in the center of an eczematous area in the axillary line, discharging a dark-green, stringy, thick pus. Restricted expansion of his left chest was noted. Physical examination of the right side of his chest demonstrated clearly that dulness on percussion, vocal resonance, and fremitus increased; subcrepitent râles were heard over the subscapular area.

The tube was at once removed, and 200 grams of bismuth-vaselin injected into the pleural cavity. Radiograph taken (Fig. 16) shows the dimension of the cavity. Temperature and pulse became normal the first evening.

June 14th to 20th: Daily dressing revealed the pus becoming serous and less in quantity. Temperature and pulse remained normal during the entire week; cough lessened; pain still present; gained 3½ pounds in weight.

June 20th to 27th: Opening remained closed all week; cough ceased entirely; pain persisted; patient gained 2½ pounds. By forcing a cannula into the chest, 30 c.c. of turbid fluid were removed.

June 27th to July 3d: Temperature and pulse remained normal; gained 2½ pounds; strength and healthy color returned; pain persisted.

July 3d to 19th: Temperature and pulse normal; gained 4½ pounds; pain ceased; began work July 5th; worked nineteen hours one day.

A systematic examination of the pus discharge disclosed very interesting findings, of which the report made by Dr. Maximilian Herzog is here given:

"Specimen 1, marked Mr. E., June 14th: Quite a number of tubercle bacilli, faintly stained, generally slender and regular, some granular and irregular. Very few in the interior of leukocytes.

"Specimen 2, marked E., June 15th: Tubercle bacilli quite numerous, two or three times as many as in specimen No. 1, better and deeper stained, but more individuals quite granular and irregular, some quite disintegrated. Many in the interior of leukocytes."

On July 3d another examination of pus showed a still further increase in the tubercle bacilli (20 to each immersion field); however, nearly all were disintegrated. On July 11th the microscopical examination disclosed the presence of very few tubercle bacilli, one to each two immersion fields. After July 11th no pus could be withdrawn, as the wound was entirely healed.

We do not regard the gradual diminution in number of tubercle bacilli in the first case, and the characteristic physical changes in the bacilli in both the cases, sufficient to establish a universal law of so vast importance. The findings are certainly very significant, in view of the fact that tuberculous sinuses and abscess cavities respond so promptly to the bismuth injection

Fig. 16.—Tuberculous empyema filled with bismuth paste. Series 3, Table F, Case 21.

Fig. 17.—Bismuth paste injected into tuberculous ankle-joint. First injection. Series 3, Table F, Case 15.

treatment. If the rapid diminution and disintegration of tubercle bacilli noted in these two cases is not accidental, this disclosure is certainly of far-reaching importance. If, after the day of his first injection, fever, cough, and sweats disappear, patient regains appetite, sleep, is able to resume work, and continues to gain weight at the rate of 2½ pounds a week for five consecutive weeks, as patient did in the second case cited, it certainly is too striking a change to be accidental.

Whether the bismuth destroys the bacilli by its chemical action, or whether its presence acts as a chemotactic, we have not yet determined, although the evidence predominates that its chemotactic property accounts for the destruction of the microörganisms.

Tubercle bacilli are not often found in the pus from tuberculous sinuses; more often, however, in tuberculous empyema. They lodge in the granulations and walls of sinuses and abscess cavities in abundance. The bismuth paste coming in contact with the walls of the sinuses containing the bacilli, and thus inducing chemotaxis, has a destructive action upon them. This, to a certain degree, explains the interesting microscopical findings of the changes and destruction of the bacilli.

The findings in the two cases above cited suggest the possibility of applying the bismuth treatment in tuberculous empyema not as yet opened. The opening could then be made intentionally for the introduction of bismuth for curative purposes.

The technic of bismuth injections employed in abscess cavities in the chest differs somewhat from the one applied in sinuses. In the chest we have to deal with an infected cavity which has a rigid chest-wall on one side, and the retracted, but more or less resilient lung on the other. It is generally believed that if the air could be prevented from rushing into the cavity with each inspiration, the lung would expand and fill up the space, but this does not explain why many cases do not heal when this principle is carried out by the suction pump* of Perthes.

Tuberculous empyema usually results from tuberculous pleurisy with effusion which has been drained. The serous fluid becomes secondarily infected, and the cavity keeps on discharging pus indefinitely. The irrigation with all sorts of antiseptic washes has usually retarded the healing. Bier's suction method, on the other hand, has in many cases hastened the obliteration, partly by drawing the lung toward the rigid chest-wall, and partly by producing a hyperemia in the false membrane. Nevertheless, a considerable number resist this form of treatment also. Our explanation of this fact is that as long as the walls which line the pleural cavity are the seat of living tubercle bacilli, we cannot expect obliteration of the space. The cavity must first be disinfected before healing be produced. Our method

* Perthes: Mitteilungen a. d. Grenzgeb. d. Med. u. Chir., Bd. vii, Heft 4, 5.

of dealing with these cases, I believe, possesses the means which are essential to the obliteration. It produces pressure, sterilizes the cavity, and stimulates healthy granulations. The microscopical findings of secretions and the results of treatment bear out this statement.

After a radiograph of the empty cavity has been taken and an examination of the secretion has been made, the cavity is injected with 100 grams of bismuth paste, formula No. 1. The drainage is at once discontinued, and the opening allowed to close. Should temperature rise above 101° F. after twenty-four hours, or the patient complain of severe pressure, the accumulated fluid should be drained off and the opening again allowed to close. If the temperature remains normal and no unpleasant symptoms arise, the 100 grams of paste injected may be left in for absorption, providing no signs of bismuth intoxication arise. Repetition of the injection is necessary only when the bismuth paste is discharged with the pus, and microörganisms are still found in the secretions. In our early experience we believed that the cavity had to be overdistended with the paste in order to produce healing, and we introduced as much as the cavity would hold. (See Fig. 15.) Such large quantities are not only unnecessary, but also liable to produce bismuth intoxication. Should any signs of this poisoning appear, the bismuth must at once be withdrawn by means of a suction pump after it has been dissolved by warm olive oil. After this the Bier suction pump is very valuable in producing a vacuum in the cavity and drawing the lung toward the chest-wall, which in its sterile condition will readily close.

We have thus far applied this method only in cases of empyema and lung abscess where drainage has long been established by operation and secondary infection was present, but its judicious application to tuberculous pleurisy seems reasonable. Tuberculous pleurisy is, in the majority of cases, either a forerunner of tuberculosis of the lung or a complication of this disease. This has been noted by most observers. In 450 cases of tuberculosis treated at the Stony Wold Sanatorium (Goodall*), 45 per cent. suffered from pleurisy during their residence at the sanatorium. In 371 autopsies on tuberculous patients, 279 cases (more than 75 per cent.) were found to have pleuritic adhesions (Banks†).

The effusion appears to have a beneficial effect upon the disease process, and its entire withdrawal is undesirable (Opie‡), since the tapping often leads to the purulent form, but aside from this it may help to disseminate the tubercle bacilli by friction of the pleural surfaces (Pinquet§). Any form of treatment which will destroy the tubercle bacilli in the pleural cavity before they have invaded neighboring structures, namely, the lung and

* Goodall: Medical Record, June 27, 1908, p. 1074.
† Banks: Annual Report, Supervising Surgeon, Gen. Marine Hosp. Serv., 1901.
‡ Opie: Experimental Pleurisy, Jour. Ex. Med., vol. ix, No. 4, 1907.
§ Pinquet: Thèse de Lyon, 1899.

mediastinum, will certainly be welcome, and this remedy, I believe, lies in the introduction of a small quantity of the bismuth paste into the pleural cavity as soon as the diagnosis of tuberculous pleurisy is ascertained.

The mechanical action of the bismuth paste is a prominent factor in the healing process. By filling the sinuses with a semisolid paste we separate the diseased walls, bringing them in contact with a substance in itself bactericidal and stimulating, slowly absorbing, and oily. The uniform pressure thereby exerted on all parts of the tracts is a desirable condition to promote healing. Pressure has a great therapeutical value. Nature produces pressure in the healing processes of inflammation. The infiltration of tissues and the accumulation of fluids in inflamed joints are examples of pressure produced by nature for healing purposes. Professor Bier's hyperemia treatment likewise indicates that pressure is a factor favorable to the process of healing.

Another factor, not entirely to be ignored, is the action of the *x*-rays upon tuberculous disease in the presence of bismuth-vaselin. Literature contains so many contributions from reliable sources on the action of the *x*-ray upon tuberculous disease that it deserves due consideration in connection with the treatment of tuberculous sinuses. Gibson claims that the *x*-ray leads to the destruction of tubercle bacilli in the body, thereby affecting the tuberculo-opsonic index. McCullough has confirmed this fact by extensive experiments upon tuberculous patients, and the same views are supported by Wilkinson in his experiments with and treatment of leprosy. Since both bismuth and vaselin are radio-active substances, and since all our cases have been exposed to the *x*-ray at least once after injection for the purpose of obtaining radiographs, we are led to inquire how much the exposure to the *x*-ray adds to the acceleration of the healing process. It must be admitted that it can play only a secondary part in the healing, since some of our noted surgeons have obtained very good results without the aid of the *x*-ray. We have noted, however, that in resistant cases, especially those where external erosions existed, daily exposure to the *x*-ray for two minutes stimulated the healing process. We do not recommend it as a routine treatment, but reserve its use to the more resistant cases with erosions.

The study of the various secretions and excretions of the body, as well as the chemical, cytotical, and opsonic changes in the blood, as affected by the bismuth injections, is still open to investigation.

Limitations.

While the method of bismuth injections has a large field for application, there are certain limitations to its use. In biliary and pancreatic fistulas, also sinuses communicating with the cranial cavity, this treatment is, for obvious reasons, dangerous.

Although we have thus far encountered no serious complications after the injection of bismuth paste, accidents are possible. The bismuth plug may, by pressure on a vital organ, produce unpleasant symptoms. It is also possible that, by overdistention of a newly formed abscess cavity, its walls may be ruptured and a new area infected. Neighboring large veins may be so altered by the suppurative process as to permit the injection to break through the thin and diseased wall, and in this way enter the circulation, causing serious consequences.

Here I desire to put on record a fatal case, with post-mortem findings, and presentation of lung specimen, reported to me by a physician from one of the western cities:

Case R.—Three years ago the patient sustained a facture of the second sacral vertebra, resulting in a loss of motion and sensation below the hips, loss of control of bladder and rectum.

A fistulous tract leading from an area of broken integument established itself two and one-half years ago, and has persisted in spite of treatment at different times with silver nitrate solution and peroxid of hydrogen. The fistula, which had its opening in the middle line over the third sacral and extended upward and to the left of the median line for about six inches, was cureted three times during the course of treatment.

On May 2, 1908, 9 a. m., an injection of two ounces of freshly prepared paste was made. Ten minutes following the injection the patient complained of pain in the chest, and began perspiring freely. At first the patient became quite blanched, but soon showed cyanosis, which continued until his death, eighteen hours later. The temperature was normal, and pulse varied between 90 and 130. The cyanosis deepened after about twelve hours, and the patient would no longer respond to respiratory and cardiac stimulants. The patient died in coma eighteen hours after the injection.

Post-mortem showed the venous capillaries of the lungs filled with bismuth paste.

Microscopical examinations of specimens were made by Dr. M. Herzog, whose report is as follows:

The small pieces of pulmonary tissue received look congested. The cut surface presents to the naked eye some white masses not much larger than the point of a pin. The material, after having been embedded in paraffin, was sectioned and stained with hematoxylin and eosin and with carbolfuchsin for the detection of tubercle bacilli.

Since the examination showed that the white masses noticed are composed of subnitrate of bismuth, and since it was necessary to distinguish beyond mistake between the bismuth salt and the coal-dust, freely present in the pulmonary tissue, sections of the latter were treated for five minutes in a hot 20 per cent. watery solution of HNO, which dissolved out the bismuth salt, but left the coal-dust unchanged.

Result of the Microscopical Examination.—The pulmonary tissue shows generally open alveoli; however, some refilled with an edematous exudate. The interalveolar septa appear partly normal, partly widened by infiltrating mononuclear cells. The interalveolar capillaries here and there are markedly

congested, as are a number of larger venules and arterioles. The congestion is perhaps best marked in the subpleural tissue. The pleura itself is inconsiderably thickened; the whole pulmonary tissue presents a marked condition of anthracosis. Cells filled with coal-dust are seen in the alveolar spaces, and more solid masses of coal-dust are found around the bronchioles and in the neighborhood of the peribronchial tissue.

The larger bronchioles are densely filled with bismuth subnitrate crystals. These do not seem to have been very long in this location, because there is no tissue reaction around the plugs of bismuth crystals. There is no evidence of any absorption of the bismuth.

The pulmonary tissue nowhere shows any distinct tubercles; however, nodules composed of round-cells, carbon-loaded cells, and extravasated red blood-corpuscles are seen.

No tubercle bacilli were discovered in these nodules.

By animal experiments we have demonstrated that the bismuth paste injected into the axilla caused death within two minutes, due to the entrance of the paste into the axillary vein, and finally blocking of the branches of the pulmonary artery. Symptoms were a sudden cyanosis, short gasping breathing, and convulsions.

Enthusiasts may be tempted to daring procedures, encouraged by the surprising results they have obtained in cases previously regarded as hopeless, and carry the treatment beyond the line of safety. We desire, therefore, to caution them against bold procedures in testing the method. We recommend its gradual conservative development. In large cities, where clinical material is abundant and many paupers treated, the physician may be tempted to place this treatment into the hands of the laity, believing it to be simple of application. Such a procedure is to be condemned. The treatment is best carried out in well-equipped hospitals, where the patient may be observed and treatment carried out scientifically.

Tuberculous conditions thus far treated with bismuth paste have been mainly sinuses originating in tuberculous osteomyelitis and arthritis; sinuses following extirpation of tuberculous kidney and lymphatic glands, rectal fistulas, and cavities following tuberculous empyema or lung abscess.

The injection was tried in a case of tuberculous ankle-joint, but owing to the great destruction of bones, the joint finally had to be opened, the sequestra removed, and then the remaining cavity filled with the bismuth paste, after which it promptly healed. The history of this case is as follows:

G. P., girl, five years old, family history negative, was well the first year of her life, when a swelling was noticed about her left ankle-joint. This was treated locally, and five months later an abscess was incised above the internal malleolus. September, 1907, a new swelling appeared at the ankle-joint. An injection into the joint, with an aspirating syringe, of one ounce of a 33 per cent. bivaselin paste in liquid state, resulted in a rise of temperature to 102° F.; pulse, 130, which gradually subsided.

Radiographs then taken disclosed that the bismuth not only reached all parts of the joint, but also entered the lower end of the tibia, where the sequestrum was lodged (Figs. 17 and 18).

A second injection was made three weeks later, and this resulted in a temperature of 104° F., pulse 145, and again a gradual remission to normal. It was then decided to remove all sequestra, which was done on the seventh of March, 1908, and a sinus resulted. This sinus was then treated by the bismuth injections and healed out within seven weeks.

This case illustrates that when caries of bone is present in a closed cavity, all sequestra should first be thoroughly removed, and at once filled up with liquefied bismuth-vaselin paste. Any attempt to close the external wound is unnecessary and even detrimental, since it prevents the escape of secretions alongside of the paste. Where sequestra are present and sinus already exists, the injections should be tried for a reasonable length of time before an operation is advised. I have at least two cases on record where sequestra were clearly demonstrated by radiographs and healed under the bismuth paste treatment.

Whether the injection of bismuth into tuberculous joints where the destruction of bone is slight or confined to the synovia is preferable to that of iodoform-glycerin, must be determined by actual trial.

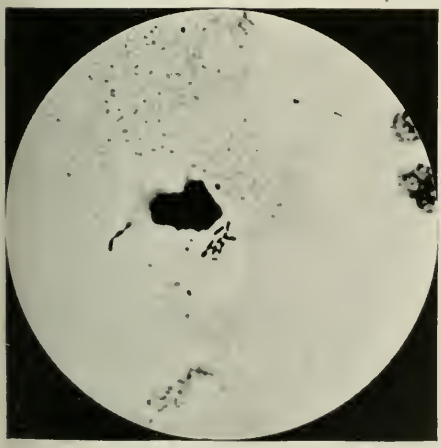
Prevention of Sinuses.

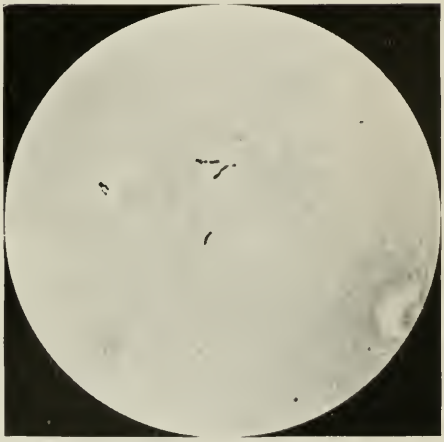
The most important advance recently made by us is the prevention of tuberculous sinuses. We have, I believe, satisfactorily demonstrated that tuberculous sinuses can also be prevented by the injection of a bismuth paste.

This method is as follows: A cold abscess following tuberculous disease should, under most aseptic measures, be opened by an incision about $\frac{1}{4}$ of an inch in length, the pus evacuated, and the cavity refilled at once with 100 to 300 grams of a 10 per cent. bismuth-vaselin paste, opening not sealed, nor drainage inserted. A sterile gauze dressing is placed over the incision, and a five-yard sterile gauze bandage is snugly put on and securely pinned, so that the patient, usually a child, cannot displace and so infect it. Dressings are to be changed daily under perfect aseptic measures. Should the opening close and fluid reaccumulate, it may be reopened, the fluid, which is then more serous, pressed out, but the injection need not be repeated. This method, properly carried out, will prevent secondary infection.

Incision and drainage of a non-febrile tuberculous abscess was heretofore considered a blunder, since it nearly always resulted in secondary infection. By our method the secondary infection is prevented mechanically, *i. e.*, the injected abscess cavity contracts, forcing a small quantity of the thick paste from within through the small incision, thereby blocking the opening and preventing the entrance of infectious material. Four cases have thus

Fig. 18.—Second injection of bismuth paste into tuberculous ankle-joint. Case 15, see Fig. 17.





Figs. 19 and 20.—Photomicrographs of disintegrated tubercular bacilli.

far been treated by us with this method, and three terminated favorably, the fourth, only recently injected, is still under treatment, progressing favorably. The first trial of this prophylactic method was made by me January 17, at the North Chicago Hospital, on a two and one-half-year-old boy, who had a tuberculous abscess about the middle of the tibia. The method described above was employed and proved successful, the cavity having closed in one week.

A second case was treated in this manner by my brother, Dr. Joseph C. Beck, a week later, when he obtained a similar result by injecting an abscess over the left orbit of a child suffering from tuberculous osteomyelitis of the frontal bone.

In the third case (Series 2, Table C, Case 1), a boy four and one-half years old with a large psoas abscess resulting from tuberculous spondylitis, the abscess was incised by me at the Home for Crippled Children, Chicago, April 10, 1908, in the manner above described. A quart of débris was evacuated, and the cavity injected with 120 grams of a 10 per cent. bismuth-vaselin paste in liquid state. The necessary precautions against infection were taken, and the temperature has remained absolutely normal up to this day, whereas it rose from 99° to 100° F. before the abscess was evacuated and injected with bismuth paste. The incision closed in four days, was intentionally reopened three days later, and about three ounces of a muddy liquid, serous in character, was squeezed out, and 60 grams of 33 per cent. bismuth injected. The opening closed three days later, has remained so, and to this date, July 20th, has not refilled.

I am under great obligations to the medical profession for reports of cases treated, which will enable me to give a comprehensive summary as to the value of this method.

I wish also to emphasize the fact that the presentation of this method of diagnosis, prevention, and treatment of fistulous tracts and abscesses is not intended to displace all other good methods now in vogue, such as Bier's hyperemia, fresh air, vaccine treatment, etc. All we ask is that our method be fully tested, and if found satisfactory, then only to be given its proper place in the treatment and prevention of tuberculous sinuses and abscess cavities.

The collective report of cases treated by this method, and obtained from surgeons of various hospitals in this country, is as follows:

The total number of cases treated is 192, of which 143 were tuberculous, 23 non-tuberculous, and 26 doubtful. Of these cases, 123, or 64 per cent., are healed at the present time; 55 cases, or 28½ per cent., are improved and still under treatment; 11, or 6 per cent., are unchanged; and 3, or 1½ per cent., died during the period of treatment or after. The varieties of affections treated and the results obtained are here tabulated. Fourteen of these cases

were treated prior to my first publication, January 15, 1908, and of these 13 cases are now entirely healed, 1 hopeless case remaining. The remainder of 178 cases were treated during the period of the last eight months.

SUMMARY REPORT OF 192 CASES TREATED BY BISMUTH PASTE METHOD.

	Total Number Treated.	Healed.	Improved.	Unchanged.	Died.
Tuberculous spondylitis with sinuses	26	13	9	3	1
" hip-joint with sinuses	43	21	19	2	1
" sacrum and iliac synchondrosis with sinuses	7	7	..	..	..
" knee-joint with sinuses	5	4	1	..	..
" ankle-joint with sinuses	4	3	1	..	..
" wrist-joint and fingers with sinuses	4	4	..	..	..
Osteomyelitis of femur with sinuses	12	6	6	..	..
" tibia with sinuses	4	3	1	..	..
" humerus with sinuses	3	1	2	..	..
" ulna with sinuses	2	2	..	..	..
Tuberculosis of fascia and muscle with sinuses	3	2	..	1	..
Empyema and tuberculous lung abscess	19	14	4	1	..
Tuberculosis of ribs with sinuses	6	4	..	2	..
Suppurative sinuses of head	6	3	3	..	..
Sinuses following tuberculous glands	6	4	1	1	..
Osteomyelitis mandibulæ	1	1	..	..	..
Sinuses following abdominal operations	16	13	1	1	1
Rectal fistulæ	18	13	5	..	..
Tuberculosis of kidney with sinuses	7	5	2	..	..
	192	123 or 64 per cent.	55 or 28½ per cent.	11 or 6 per cent.	3 or 1½ per cent.

Conclusions.

1. A successful surgical operation for tuberculous sinuses or fistulas depends principally upon an exact knowledge of the extent, direction, and number of sinuses before the operation is undertaken.

2. Radiographs obtained by previously injecting the sinus with a bismuth paste show distinctly the origin and extent of sinuses. Such radiographs should always be taken before an operation is decided upon.

3. Tuberculous sinuses, fistulous tracts, abscess cavities, including empyema, can be cured by injecting them with a 33 per cent. bismuth-vaselin paste, and in most cases surgical operation becomes unnecessary.

4. The formation of sinuses and fistulous tracts may be prevented by opening cold abscesses, evacuating the fluid, and at once injecting a quantity (not exceeding 300 grams) of 10 per cent. bismuth-vaselin paste, and not sealing the opening.

5. When sequestra are present, the injections should be tried for a reasonable length of time, and risky operations should be reserved as a last resort.

6. Bismuth subnitrate is a bactericidal, chemotactic substance, which is slowly absorbed and slowly eliminated. Injections up to 100 grams of the 33 per cent. paste produce no toxic effect. In large doses it may produce symptoms of intoxication, such as ulcerative stomatitis, black border of gums, diarrhea, cyanosis, desquamative nephritis, and loss of weight.

7. While these injections are effective in all suppurative sinuses and cavities, those of tuberculous origin respond to them more readily.

8. The secretions from sinuses change their character after the injection, becoming seropurulent or serous, and microörganisms gradually diminish and often disappear. Tubercle bacilli are no exception.

9. This method of treatment is applicable to the suppurative accessory sinuses of the head.

10. That patients regain their general health, gain rapidly in weight after the sinuses are closed.

SERIES I.—TABLE A.

TABLE OF SINUSES AND EMPYEMA CURED UNDER THE BISMUTH PASTE TREATMENT. AUGUSTANA HOSPITAL, CHICAGO. REPORT BY DR. OCHSNER. FROM JANUARY 15 TO JULY 15, 1908.

No.	Name.	Age.	Disease.	Duration.	Number of Sinuses.	Number of Operations.	Number of Injections.	Present Remarks.
1	David A.	31 years.	Pyonephrosis.	8 months.	1	Two, incision and later extirpation.	5 times.	Healed after five injections.
2	Charles D.	21 years.	Dorsal Pott's disease.	2 years.	3	Two.	3 times.	Healed after three injections.
3	G. G. (male).	30 years.	Empyema.	6 months.	1	One.	7 times.	Healed.
4	W. R.	45 years.	Pyonephrosis.	18 months.	1	One.	1	Healed at once.
5	Miss S	18 years.	Sinus following dermoid cyst.	1½ years.	1	Two.	4 times.	Healed in one month.
6	John B.	35 years.	Tuberculous knee-joint and sinus in right lower abdomen.	17 months.	2	Two.	Knee, 1	Knee healed after first injection. Abdomen fistula nearly healed.
7	Miss K.	20 years.	Tuberculous kidney.	2 months.	1	Nephrectomy.	7 times.	Healed.
8	H. L.	11 years.	Pyopneumothorax.	13 months.	1	Resection of seventh rib.	5 times.	Healed.

SERIES I.—TABLE B.

TABLE OF SINUSES AND EMPYEMA STILL UNDER THE BISMUTH PASTE TREATMENT. AUGUSTANA HOSPITAL, CHICAGO.

No.	Name.	Age.	Disease.	Duration.	Number of Sinuses.	Number of Operations Previous to Bismuth Injection.	Number of Injections.	Present Conditions.
1	J. A. (male).	35 years.	Tuberculous coxitis. Once healed up.	31 years.	1	Two.	Vaccination and 14 injections of Bi. since January 25th.	Discharge greatly reduced. Patient improved.
2	Master R.	2½ years.	Osteomyelitis left humerus.	4 months.	2	Curetage of humerus.	7 injections.	Improved.
3	J. T. S. (male).	44 years.	Pott's disease.	20 months.	1	Incision.	9 injections.	Improved.
4	A. S. (male).	36 years.	Tuberculous intra-abdominal abscess.	3 months.	1	Drainage of abscess. Laparotomy; opening transverse colon.	5 injections.	Fecal fistula developed several months after injections were stopped.

SERIES I.—TABLE B.—(*Continued.*)

No.	NAME.	AGE.	DISEASE.	DURATION.	NUMBER OF SINUSES.	NUMBER OF OPERATIONS.	NUMBER OF INJECTIONS.	PRESENT CONDITIONS.
5	L. A. (female).	6 years.	Tuberculosis of iliac synchondrosis.	1 year.	1	Incision of abscess.	15 injections.	Much improved. Fourteen sequestra exfoliated since injections were begun.
6	H. L. (male).	17 years.	Osteomyelitis of femur.	2 years.	1	Moorhof operation.	7 injections.	Improved.
7	Laura L.	16 years.	Spondylitis (tub.).	11 years.	1	Spontaneous rupture.	6 injections.	Improved.
8	J. D. K. (male).	25 years.	Osteomyelitis left tibia.	18 years.	1	Removal of portion of tibia and Moorhof plug.	10 injections.	Improved.
9	E. C. (male).	2½ years.	Mastoid.	6 months.	1	Curetage.	7 injections.	Unchanged.

SERIES II.—TABLE C: HOME FOR DESTITUTE AND CRIPPLED CHILDREN, CHICAGO. REPORTED TO THE AMERICAN ORTHOPEDIC ASSOCIATION, JUNE 6, 1908, BY DRS. RIDLON AND BLANCHARD.

TABLE 1.—CASES OF TUBERCULOUS SINUSES CURED UNDER THE BISMUTH PASTE TREATMENT FROM FEBRUARY 3 TO JUNE 6, 1908.

No.	NAME.	AGE.	DISEASE.	DURATION.	NUMBER OF SINUSES.	NUMBER OF INJECTIONS.	REMARKS.
1	Tom S.	13 years.	Hip disease.	8 years.	2	15 injections.	Cured in 1 month.
2	Jake T.	5 years.	Hip disease.	1 year.	1	7 injections.	Cured in 1½ months.
3	Eddie H.	7 years.	Pott's and hip disease.	2 years.	1	1 injection.	Cured in 7 days.
4	John B.	9 years.	Hip disease.	4 years.	3	11 injections.	Cured in 33 days.
5	Robert L.	11 years.	Hip disease.	1 year.	1	6 injections.	Cured in 1 month.
6	Walter P.	7 years.	Pott's and hip disease.	11 years.	2	7 injections.	Cured in 18 days.
7	James P.	5 years.	Tuberculous finger.	2 years.	2	2 injections.	Cured in 10 days.
8	Loretta H.	8 years.	Hip disease.	4 years.	2	13 injections.	Cured in 1 month.
9	Dorothy T.	12 years.	Pott's disease.	2 years.	1	1 injection.	Cured in 7 days.

Series II.—Table D.

TUBERCULOUS ABSCESSES OPENED AND INJECTED ONLY ONCE WITH BISMUTH PASTE.

No.	Name	Age	Disease.	Duration.	Number of Sinuses.	Number of Injections.	Remarks.
1	Elmer H.	5 years.	Pott's disease. Psoas abscess	..	..	..	Cured in 9 days.
2	Sam J.	7 years.	Hip disease. Thigh.	..	..	..	Cured in 9 days.

Series II.—Table E.

CASES OF TUBERCULOUS SINUSES STILL UNDER THE BISMUTH PASTE TREATMENT.

No.	Name.	Age.	Disease.	Duration.	Number of Sinuses.	Number of Injections.	Duration of Treatments.	Present Condition.
1	Chas. T.	9 years.	Hip disease.	3 years.	1	20 injections.	3 months.	Unchanged.
2	John K.	12 years.	Hip disease.	1½ years.	3	13 injections.	3 months.	Improved.
3	William B.	6 years.	Hip disease.	1½ years.	2	22 injections.	3 months.	Unchanged.
4	Martin S.	12 years.	Hip disease.	6 years.	1	6 injections.	1 month.	Improved.
5	Fannie L	15 years.	Pott's disease	6 years.	6	28 injections.	3 months.	Improved.
6	Annie M.	7 years.	Pott's disease.	1½ years.	3	10 injections.	1 month.	Improved.
7	Sam C.	11 years.	Pott's disease.	5 years.	3	27 injections.	3 months.	Improved.
8	Henry R.	11 years.	Pott's disease.	8 years.	3	11 injections.	1 month.	Unchanged.
9	Vincennes D.	7 years.	Hip disease, excised head.	..	4	2 injections.	1 week.	Result awaited.
10	Denny C.	8 years.	Hip diseased, excised head.	..	3	2 injections.	1 week.	Result awaited.
11	Benj. B.	8 years.	Tuberculous knee.	2 years.	2	1 injection.	1 week.	Result awaited.
12	Eliz. B.	11 years.	Hip disease, excised head.	4 years.	2	2 injections.	1 week.	Result awaited.
13	Louis R.	11 years.	Hip disease.	3 years.	1	4 injections.	1 week.	Result awaited.

SERIES III.—TABLE F: NORTH CHICAGO HOSPITAL, CHICAGO. REPORTS BY DRS. CARL, JOSEPH C., AND EMIL G. BECK.

CASES CURED UNDER BISMUTH INJECTION TREATMENT FROM APRIL 26, 1906, TO JULY 20, 1908.

No.	Name.	Age.	Disease.	Sinus Duration.	Number of Sinuses.	Operations Previous to Bismuth Injection.	Number of Injections, 1906.	Remarks.
1	A. D. (female).	6½ years.	Tuberculous spondylitis.	2 years.	1	None.	1	Healed after diagnostic injection, remained closed since April, 1906.
2	Martin Y.	14½ years.	Tuberculous knee-joint.	7 years.	3	5	4	Healed in thirty days, remained closed since November 1, 1907. Case reported in preceding pages.
3	Herman A.	19½ years.	Lung abscess.	9 months.	1	1	10	Healed in twenty days, remained closed since January 10, 1908.
4	Miss M. G.	22 years.	Tuberculous hip-joint.	14 years.	3	14	15	Healed in sixty days, remained closed since February 10, 1908.
5	Miss E. P.	43 years.	Osteomyelitis of femur.	6 years.	2	3	6	Healed in thirty days, remained closed since February 22, 1908.
6	Miss E. S.	19 years.	Tuberculosis of iliac bone.	4 years.	1	2	3	Healed after diagnostic injections remained closed.
7	Mr. J. P.	19 years.	Rectal fistula (tuberculous bone).	1 year.	1	2	1	Healed after diagnostic injections remained closed. Case reported in preceding pages.
8	Mr. A. G.	18 years.	Rectal fistula (tuberculous bone).	3 months.	1	2	16	Healed in sixty days. Gained thirty pounds.
9	Mr. M. A.	25 years.	Fecal fistula	9 months.	1	3	1	Healed after diagnostic injection.
10	Mrs. H. R.	26 years.	Sinus after extirpation tuberculous kidney.	16 months.	1	2	20	Healed in three months. Patient gained 65 pounds.
11	J. G. (male).	26 years.	Tuberculous hip-joint.	9 years.	1	2 major and 1 minor.	1	Healed after diagnostic injection, August 2, 1906.
12	Syrian child.	4 years.	Tuberculous osteomyelitis of ulna.	6 months	1	1	2	Healed. This child developed tubercular abscess on the forehead; cured by prophylactic method.
13	Mr. K	32 years.	Tuberculosis of metacarpal bones.	2 years.	4	4	24	3 healed in 1 week, fourth took 2 months.
14	M. G. (male)	4 years.	Tuberculous osteomyelitis metacarpal bone.	4 months.	1	1	6	Healed in three weeks.
15	Gr. P. (female).	5 years.	Tuberculosis of ankle.	4 years.	2	Incision four years ago. Curetage, March, 1908.	8	Healed. This case is reported in preceding pages.
16	M. W. (female).	13 years.	Tuberculous hip-joint.	6 years.	1	9 iodoform injections.	20	Healed in ten weeks. Case reported in preceding pages.
17	Miss M. V.	25 years.	Tuberculous spondylitis.	2 years.	1	1	10	Healed in six weeks.

SERIES III.—TABLE F.—(*Continued.*)

No.	NAME	AGE.	DISEASE.	SINUS DURATION.	NUMBER OF SINUSES.	OPERATIONS PREVIOUS TO BISMUTH INJECTION.	NUMBER OF INJECTIONS, 1906.	REMARKS.
18	Mrs. C. W.	50 years.	Tuberculous spondylitis.	13 years.	3	3	4	Healed in three weeks. Pain disappeared.
19	Mr. A. R.	25 years.	Tuberculous rectal fistula.	4 years.	2	None.	8	Healed in two weeks. Pain disappeared.
20	Mr. J. K. P.	61 years.	Tuberculous rectal fistula.	40 years.	5	None.	2	All healed in six days pain ceased.
21	Mr. W. J. E.	37 years.	Tuberculous lung abscess.	6 months.	1	1	1	Healed in two weeks. Gained 14 pounds in five weeks. Case reported in preceding pages.
22	Carl L.	43 years.	Tuberculous orchitis.	6 weeks.	1	1	2	Healed in three days; six weeks' Bier's treatment without result.
23	Miss P. W.	21 years.	Tuberculous osteomyelitis of femur.	10 years.	1	2	2	Healed in two weeks. Joint remains ankylosed
24	Miss S.	15 years.	Chronic suppurative antrum.	years.	1	1	2	Healed in two weeks.
25	Mrs. H.	33 years.	Chronic suppurative antrum.	8 years.	1	1	1	Healed in seven days, remained healed since March 1st.
26	Mary H.	7 years.	Empyema pleuræ.	1 year.	3	None. (Spontaneous rupture in left fourth intercostal space.)	6	Healed in twenty-one days, gained 12 pounds in eight weeks.

SERIES III.—TABLE G.

CASES TREATED BY PROPHYLACTIC METHOD.

No.	NAME.	AGE.	DISEASE.	DURATION OF ABSCESS.	OPERATION.	REMARKS.
1	Master A. G.	2½ years.	Tuberculous osteomyelitis of tibia.	1 week.	Evacuation of pus. Injection of cavity with bismuth paste.	Abscess healed. Sinus prevented.
2	Syrian child.	4 years.	Tuberculous osteomyelitis of orbital bone.	6 days.	Evacuation of pus. Injection of cavity with bismuth paste.	Abscess healed. Sinus prevented.
3	L. Z. (male).	10 years.	Tuberculous osteomyelitis of femur.	Not known.	Osteotomy and filling cavity with bismuth paste.	Sinus formed, but healed in four weeks.
4	S. L. (male).	30 years.	Tuberculous hip-joint.	Years.	Joint opened April 18, '08, cureted, filled bismuth paste.	Primary union. Fistula prevented. Patient well.
5	R. F. (male).	30 years.	Tuberculous hip-joint.	3 years in bed.	Abscess opened on thigh. Injection followed canal into joint.	Patient improving. Awaiting result.
6	Mrs. S. B.	28 years.	Tuberculous osteomyelitis of femur.	6 weeks.	Cureting abscess of femur and bivaselin injection.	Sinus formed and healed in five weeks.

Series III.—Table H.

CASES STILL UNDER THE BISMUTH PASTE TREATMENT.

No.	Name	Age.	Disease.	Sinus Duration.	Number of Sinuses.	Previous Operations.	Number of Injections.	Duration of Treatment.	Remarks.
1	Mr. E. S.	22 years.	Tubercular spondylitis.	18 years.	8	15 principally radical.	130	7 months.	Somewhat improved.
2	Mr. L. A.	34 years.	Sinus from osteomyelitis of sacrum.	4 years.	1	4 major.	20	3 months.	Nearly closed.
3	Mr. L. H.	42 years.	Tuberculous hip-joint.	4 years.	11	1 minor and 2 major.	15	3 weeks.	Marked improvement. 6 sinuses closed.
4	Mr. H. P.	19 years.	Tuberculosis of ankle-joint.	10 months.	3	3 major.	3 in ten days.	3 months.	Unchanged.
5	Mrs. E. C.	21 years.	Tuberculous rectal fistula extending into pelvis.	4 years.	2	3 extensive.	15	6 months.	Nearly closed. Patient gained 15 pounds.
6	Mrs. B.	32 years.	Rectovaginal fistula.	5 years.	1	1	10	1 month	Improved.
7	Jos. L. G.	44 years.	Tuberculous kidney.	8 years.	1	Incision 1900; nephrectomy, 1901.	1, July 14.	..	Sinus stopped same day; final result awaited.
8	Harry H.	31 years.	Tuberculous orchitis and cystitis.	10 years.	3	4. One for double orchectomy and 3 for urinary fistula.	4 in 14 days.	16 days.	Nearly closed.
9	Mrs. S.	..	Double sphenoidal sinusitis.	Several yrs.	..	1	3	60 days.	Much improved.
10	Mr. B. H.	23 years.	Tuberculous empyema.	3 years.	1	1	10	3 months.	Improved. Detailed history in preceding pages.

Traitement chirurgical des sinus tuberculeux.—(Beck.)

Diagnostic.—Le succès du traitement chirurgical des sinus tuberculeux dépend de la correction du diagnostic anatomique. Les frontières et toutes les ramifications peuvent être clairement indiquées par des radiographes obtenus de cette manière: on injecte dans la fistule une pâte de bismuth-vaselin à 33 pour 100 qui a été liquéfiée à la chaleur et qui se solidifie rapidement après injection.

Traitement.—L'injection de pâte de bismuth-vaselin a paru plus efficace encore pour guérir les sinus et les abcès tuberculeux, y compris l'empyème de la plèvre. Dans certains cas qui s'étaient montrés longtemps réfractaires au meilleur traitement médical et chirurgical, la suppuration a cessé et la guérison s'est produite en quelques semaines. Quand un séquestre est le foyer de la maladie, it faut ordinairement l'enlever. Le sousnitrate de bismuth est une chose excellente pour ce genre de traitement, car il est bactéricide, s'absorbe lentement et n'a pratiquement pas de propriétés toxiques.

Prophylaxie.—On peut empêcher les traits fistuleux en ouvrant l'abcès froid par une incision de trois quarts de centimètre: on fait évacuer le pus et on remplit immédiatement la cavité de l'abcès avec une pâte de bismuth-vaselin à 10 pour 100, sans fermer l'ouverture. . Cela empêche une infection secondaire qui contre-indiquait jadis l'incision des abcès tuberculeux.

Rapport collectif des cas traités de cette manière, depuis cinq mois, dans les hôpitaux généraux, les hôpitaux militaires et maritimes des États-Unis, et par les praticiens.

Tent life for the tuberculous patients.

One of the wards.

HOW THE STATE OF MINNESOTA CARES FOR ITS INDIGENT CHILDREN SUFFERING FROM TUBERCULOSIS OF THE BONES AND JOINTS.

By Arthur J. Gillette, M.D.,

Surgeon-in-Charge of the Minnesota State Hospital for Indigent Crippled and Deformed Children, St. Paul, Minnesota.

What mental anguish mothers would be spared if they only knew how rare it is for a child to be born a cripple, and when it does occur, with a very very few exceptions, how easily they are cured. Of what a terror they would be relieved if they knew that mental impressions have nothing whatever to do with the deformities and birth-marks which do exist. Injuries, too, seldom result in deformities. Even physicians do not realize that most deformities are the result of disease developed during infancy and childhood. The disease in most instances is tuberculosis of the bones and joints. There are deformities acquired by other diseases, but tuberculosis directly or indirectly causes more than half.

By what channel the bacillus of tuberculosis enters the bones and joints is not the concern of this paper, but chiefly its contagiousness, and the necessity of a State institution to care for those children whose parents are not able to give them the proper food and clothing, house them properly, or furnish mechanical appliance, or a surgeon. As long as the disease is confined to the bone or joint and there are no discharging abscesses, it is not contagious. There are authorities who claim that tuberculosis of a bone or joint is always secondary; that the primary lesion is either in the lungs, the pleura, the glands, the nose, the throat, the ears, the intestinal or urinary tract. We have not always been able to find lesions elsewhere than in the bones and joints in our cases, but in most cases we do, and it probably precedes the bony involvement. It is hard to estimate from statistics just what proportion of tuberculosis of the bones and joints have abscesses.

Tuberculous abscesses are very erratic, to say the least. They come on insidiously, and sometimes disappear the same way. They may appear as an early symptom. They may show themselves at a stage in the treatment when all is progressing most favorably. They sometimes appear when all the symptoms have disappeared and the child is walking about.

Cases which are properly handled from the onset of the disease may sup-

purate; neglected cases are more likely to do so. The children of the poor must of necessity be neglected, either through indifference or want of means. Undoubtedly every discharging sinus from a tuberculous lesion contains the bacillus of tuberculosis, even though we are not always able to demonstrate it. These openings leading to the joint remain patent for so long that they soon contain many other bacteria and pus-forming microörganisms, as well as the bacilli of tuberculosis. We have had them with a most virulent form of diphtheria in the sinuses leading from the tuberculous abscesses.

Children have been brought to our hospital with running sores, who, with the aid of crutches, were attending public school; their clothes in the region of the abscess saturated with its discharge; not even the crudest kind of a surgical dressing applied. Not all children with tuberculosis in the bones and joints are in danger of communicating the disease to others. Far from it. All children who have tuberculosis of the bones should be examined for abscesses and for other sources from which the disease might be contagious, at least before attending school. Usually these children, however, are too ill to attend school, and it is in their own home where the danger lies, for we are dealing with people whose homes are very likely to be poorly ventilated. Even if we could instruct them as to ventilation, it would be impossible for them to carry out the instructions. As to nourishment, it is impossible for them to obtain the proper food, and should it be furnished, often they do not know how to prepare it.

If you wish to isolate the patient, in cases of discharging abscesses, or when they are complicated by lung involvement, even if they are made to appreciate its importance, they are unable to follow the instructions. In order to dress these abscesses they must have the means to purchase material for surgical dressings. Three years would probably be a fair estimate of the time it takes to cure these cases. Therefore the parents or relatives become indifferent to warnings, forget the dangers, and become careless, for their idea of a cure is when the pain is relieved. They pay little attention to the abscesses as long as the child can run about and play.

We have hoped much that the *x*-rays would locate for us the first foci of the disease, and we would be able to remove it and thus shorten the period of treatment. With this we have been more or less disappointed. The congestive treatment, the iodoform injections, and other chemicals help some.

We have established no hard-and-fast rules in treating these cases. Rest and protection for the inflamed tissues is the one treatment which is always imperative, for without it good results cannot be obtained. This is the hardest of all to be given outside of a hospital, for the laity do not understand the appliances, and more than half the time the child will have them off, or neighbors and friends will soon convince the parents that they

are barbarous instruments of torture. We have known them to remove the apparatus even when the child cried for its reapplication to relieve its pain. In our hospital work the importance of the rest and the correct understanding of the mechanical appliance is the most difficult part for the nurses and house doctors to understand. We have several times known of the children in the hospital asking that the weight might be increased to relieve their suffering, or directing the attendants in its application. In short, experience has taught them, after long suffering, what rest will do for their disease.

Radical operations and excisions in children cannot be compared with adult operation results. The result of operating on a child is not known when the wound is healed and the disease seemingly eradicated, but when the child has reached his growth; only then will we know how useful or how useless the limb may be. Whatever method of treatment is employed, the mechanical treatment remains necessary, and with any adjuvant it takes months and sometimes years to cure these tuberculous deformities.

This emphasizes the necessity for a State hospital for deformed indigent children.

While tuberculosis is by far the most common cause of deformity in children, yet we have other diseases, more or less contagious or infectious, resulting in deformities. Infantile paralysis, the cerebral palsies, and the deformities resulting from anterior poliomyelitis next to tuberculosis are a great causative factor in the production of crippled children. Much can be done for these children, and they too, require years of treatment. These children are not able to cope with other children in the school-room, either physically or mentally, hence the importance of an educational department connected with these State institutions.

The congenital deformities usually quite readily respond to treatment, yet the mechanical and educational side must not be lost sight of.

The various other infectious diseases of bones and joints and muscles occurring in children require especial attention to hygiene and diet, which cannot be successfully or properly done when the purchase of it would be more than the parents could afford.

There is no trouble in keeping the children suffering from non-tuberculous deformities from contracting tuberculosis from the children who have deformities caused by tuberculosis. With numerous rooms, plenty of fresh air, and abscesses dressed by properly educated attendants, there is no danger. As all deformed children in a general way require the same constitutional care and education, it is economic to have a State Hospital for indigent crippled and deformed children.

The surgery, then, of infants and children, and the medical treatment as well, is so widely different from adult surgical diseases and medical diseases

that a special education for the nurses and for the doctors is necessary, and a special hospital, especially built and especially equipped for orthopedic cases, is imperative. This was the reason why, in 1897, the Legislature of the State of Minnesota authorized the Board of Regents of the State University, which had a medical department, to make provision for the care and treatment of indigent children who were crippled or deformed, or who were suffering from diseases from which they were likely to become crippled or deformed. The work was found so beneficial that from year to year the appropriations have been increased as the work required. In 1906 the citizens of St. Paul, Minnesota, presented to the State of Minnesota a hospital of about 100 beds to be used for crippled and deformed children, and also 23 acres of land in the country to be used as a summer home.

We have found the educational department of immense practical value, for many of these children have been obliged to remain as many as and sometimes more than three years, and then left the hospital not only cured of their deformity, but able to read and write, and in some instances this was the only education they ever had or ever will receive.

In this age of philanthropy and public charities, failure of the State and Government to make these unfortunates a public charge can be due only to lack of knowledge of their number and of the practicability of their cure. They are scattered among the community, and no statistics exist showing their aggregate number.

It seems that it would be well for this International Congress on Tuberculosis to pass a resolution urging Congress to a favorable action on an amendment already introduced and referred to the Committee on Census, the purpose of which is to get official statistics of crippled and deformed children. Minnesota was the first State in the Union to inaugurate this work, and our greatest difficulty was the want of exact numerical data, for legislators are loath to load the State with any unheard-of institution. We now have no trouble in getting adequate funds to continue the work in Minnesota, for our report plainly demonstrates the economic side of this question.

The State of Minnesota, to date, has treated about 460 crippled and deformed children. We have had 33 deaths; 11 have not been improved; 6 have refused treatment. We have relieved of disease 334 children, and they are able to get about and care for themselves. Those remaining under treatment give promise of even better results. No matter how extensive the disease or unpromising the result, every tuberculous case applying to the hospital has been treated. Of these, eighty per cent. have been relieved of all evidences of active disease.

Most of these children came to the hospital on crutches; others on cots or stretchers.

A view of the twenty-three acres situated at Phalen Park, St. Paul, presented by the citizens of St. Paul.

The school-room.

Como el Estado de Minnesota Cuida por los Niños Indigentes Afectados de Tuberculosis de los Huesos y de las Articulaciones.—(GILLETTE.)

En 1897 el Estado de Minnesota fue el primer Estado apropiar dinero para el cuido de los niños indigentes. Dede 1897 cierto número de los otros estados han hecho apropiaciones semejantes. Al presente no es una cosa dificil conseguir dinero de cada Estado para el tratamiento y educación de esta clase de niños. Esto es de una importancia especial por que como unas tres cuartas partes de estos niños indigentes estan afectados de tuberculosis de los huesos y de las articulaciones. Muchos de ellos tienen complicaciones de tuberculosis de los pulmones, intestinos, etc., y un por ciento considerable de ellos sufren de abscesos y otras afecciones, no solamente de origen tuberculoso, sino que tambien contienen otros microorganismos infecciosos. Muchos de estos niños concurren á las escuelas públicas, y no existe provisión en cuanto á la protección de los niños sanos en las escuelas, ó para prevenir el contagio en sus propias familias.

Algunes veces se necesitan muchos años para curar á un niño afectado de tuberculosis de los huesos y de las articulaciones, y por lo tanto el aspecto de la educación es un problema importante. Los niños deberán ser educados, y también deberá dárseles una instrucción especial en ciertas clases de trabajo á fin de que más tarde estos puedan soportarse con sus propios esfuerzos.

Comment l'état de Minnesota prend soin des enfants pauvres atteints de tuberculose osseuse et articulaire.—(GILLETTE.)

En 1897 la Législature de l'État de Minnesota a la première votaient une subvention pour le soin, par l'État, des enfants estropiés et difformes. Depuis 1897, nombre d'Etats ont imité cet exemple. A l'heure présente, il ne serait pas difficile d'obtenir de l'argent de n'importe quel État de l'Union pour traiter et élever cette classe de malheureux.

Cela est d'une grande importance, car l'expérience a montré qu'environ les trois quarts de ces enfants estropiés ou difformes sont atteints de la tuberculose des os et des articulations. Chez un grand nombre il y a complication de tuberculose pulmonaire, intestinale, etc.; beaucoup ont des abcès et des ulcères purulents qui contiennent non seulement des bacilles de tuberculose, mais encore d'autres micro-organismes infectieux. Beaucoup de ces enfants vont à l'école publique et l'on n'a pris aucune mesure pour protéger leurs camarades sains ou pour empêcher la contagion dans leurs propres familles.

Il faut parfois un nombre d'années pour guérir un enfant atteint de tuberculose osseuse et articulaire et le problème de leur éducation est de

la plus haute importance. Cette éducation leur est due, aussi bien qu'une instruction professionnelle spéciale qui puisse leur servir plus tard et leur permettre de gagner leur vie.

DISCUSSION.

Dr. Henry W. Frauenthal (New York) reported a number of cases in which he had used the bismuth paste successfully. He also spoke favorably of the Bier hyperemic treatment.

Dr. B. H. Whitbek (New York) said that, something over a year ago, a hospital had been established at Sea Breeze, Long Island, and that marked success had been obtained in the treatment of surgical tuberculosis at that hospital. The patients seemed to do so much better than they did in the hospitals in the city. The little patients were allowed, in the majority of cases, to take their daily sea-bath, after which a new dressing was applied.

Dr. Eugene Caravia (New York) said that these lesions were only local manifestations of a general tuberculosis, and while these local remedies, the bismuth paste, hyperemia, etc., were good for the local condition, yet they did not act upon the general condition. He believed something should be used which would act upon the general condition, and felt that we had such a remedy in Cuguillere's vegetable serum.

Dr. Bradford, in closing, agreed with Dr. Caravia that the treatment of the general condition was most important, but he believed fresh air was the most important measure in this direction.

Dr. Beck, in closing, said it was true that we had to treat the general condition, but that did not prevent us from treating the sinuses. In the absence of any absolute remedy for the general treatment of tuberculosis, we should treat the local condition as best we could.

Dr. Meyer, in closing, said we should individualize in treating tuberculosis —that is, not attempt to have any fixed way of treating every form of surgical tuberculosis, but treat each condition according to the indications in that case. In certain cases where the lungs were also involved, the lung suction mask should be used also.

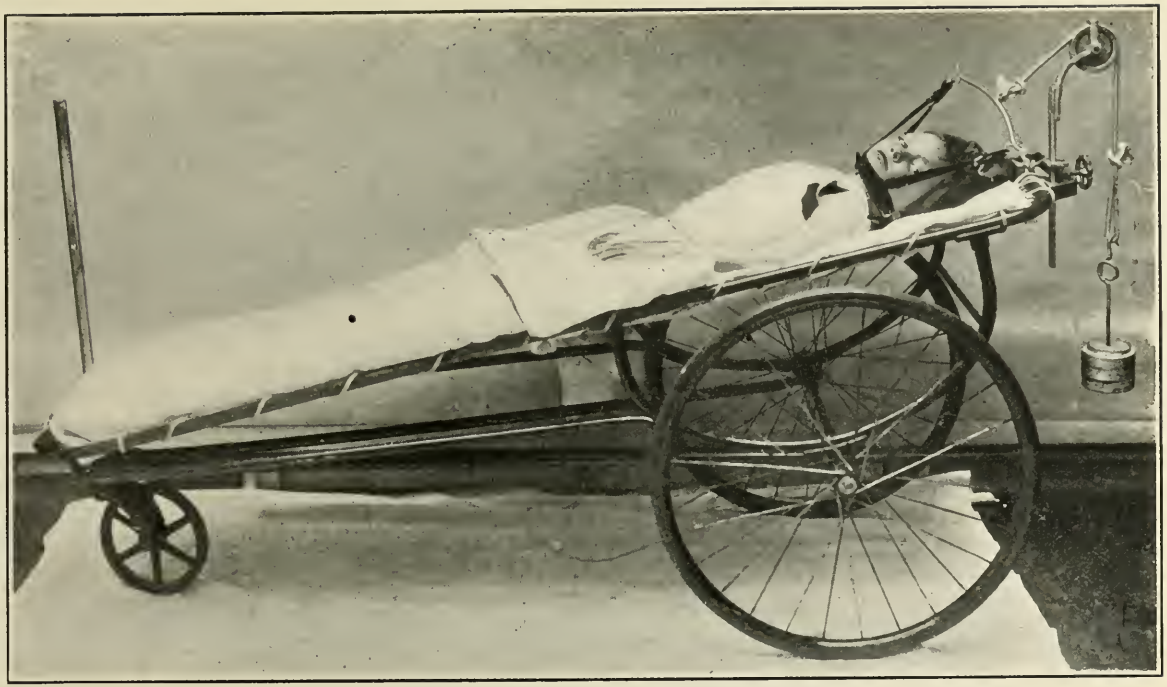


Fig. 1.—Wheeled litter for tuberculosis of the spine.

OPEN-AIR TREATMENT OF SURGICAL TUBERCULOSIS.

By De Forest Willard, M.D.,
Philadelphia.

The facts presented in this paper for discussion are intended to encourage, not the trained sanatorium expert, but the family physician, in his fight against early tuberculosis of the bones and joints. Such a physician may have carefully tested the effect of this method in tuberculosis of the lungs, yet it may never have occurred to him that a tuberculous joint requires the same form of treatment.

It is upon the family physician that we must depend for the early recognition of these tuberculous conditions, in order that he may at once combat them or refer the case to a trained specialist. The first few weeks of a tuberculous infection offer the golden opportunity for arrest and abortion of the invasion, and of cure with good function mobility. It should always be remembered that the onset of joint tuberculosis is insidious, and usually without violent symptoms. Early diagnosis in hip or knee or spine disease, as indicated by brain recognition of occult pain, as demonstrated by muscular rigidity—the guarding of the joint—is, therefore, of prime importance. To diagnose a slight intermittent limp, accompanied by fixation of the joint, as a case of rheumatism is absolutely unjustifiable, since rheumatism of a single joint in a child without positive symptoms practically *never* exists.

Not until physicians learn that an enormous percentage of lifelong deformities of hip, knee, spine, etc., prolonged suppurations, and loss of life are due to their careless and ignorant diagnosis of "rheumatism" will these dreadful results cease. Ninety-five per cent. of joint tuberculous cases are criminally treated for rheumatism for weeks or months, when a five minutes' examination of the naked child would have convinced the medical attendant that a serious disease was threatened.

For thirty years, even before Koch's discovery of the tubercle bacillus, I have persistently advocated and practised the fresh-air method of treatment for tuberculosis of hip and spine, and have never known it to be without benefit.*

At the outset let it be definitely understood that the employment of

* Willard: Trans. Amer. Med. Assoc., 1880. Jour. Amer. Med. Assoc., July, 1903.

the open-air treatment for surgical tuberculosis in no sense implies that either surgical or mechanical measures are to be neglected in the slightest degree. Aspiration, injection, incision, erasion of the diseased focus, excision, amputation, any of these measures may be necessary in individual and advanced cases, but both before and after operation the surroundings of the patient will have much to do with cure. Mechanical protection, immobilization, traction, fixation, and rest are also essential requisites. As an important accessory to these surgical and mechanical measures, however, pure fresh air taken into the lungs in 25,000 daily doses should certainly commend itself to intelligent physicians in preference to three doses per day of nauseous drugs, which may interfere with digestion rather than improve it. This adjunct should no more be neglected than should an abundance of food, sleep, and rest for oxygenating, vivifying, and renewing tissues, improving digestion and circulation.*

Tuberculin and serum injections; vaccine therapy, regulated by the opsonic index; immunization; Bier's hyperemic congestion; bismuth injections, all have a limited but less important place.

The results of open-air treatment are more positive in tuberculosis of the bones and joints even than in lung diseases.†

Many cases formerly requiring the knife are now successfully combated and often cured without open suppuration, and oftentimes with decided improvement in function. I recall a patient whose hip had been excised, and on whom three or four subsequent erasions had been performed for persistent suppuration, with amyloid liver and spleen and kidneys, and a dozen discharging sinuses, and in whom further operative interference was deemed inadvisable, yet who recovered with closed sinuses after a short residence at the seashore, and when seen, ten years later, was in excellent health.

Tubercle bacilli die if exposed for a short time to the rays of the sun. Laboratory experiments show that bacterial proteids are broken up by direct sunlight, so that the nitrogenous elements after exposure exist in soluble form.‡ Tubercle bacilli thrive in darkness, confined air, and filth; they die in sunshine, and are inhibited by cold fresh air and by increased general health. To expose the patient and even the affected joint to the direct rays of the sun is therefore beneficial. The benefit of sunshine upon plants, animals, and men is too well known to be ignored. Every plant and tree turns to the light. Even the arrest of the ultra-violet rays of sunshine by glass in the windows may have an influence.

Colorado, California, Arizona, and New Mexico undoubtedly owe their

* Wilson: Penna. Med. Jour., Jan., 1906. Halsted: Amer. Med., Dec., 1905.
† Bradford: Boston Med. and Surg. Jour., Jan., 1906.
‡ Vaughn: Jour. Amer. Med. Assoc., 1908, section, Diseases of Children.

reputation largely to the extra hours of sunshine and the time permissible for outdoor life. Tuberculosis increases when climatological conditions compel individuals to be confined in dark, close rooms. Cold inhibits bacterial development, but does not kill. It is beneficial in proportion as it stimulates muscular activity, appetite, sleep, circulation, and increases oxygenation and vital cell-resistance and nutrition. Its benefit is largely dependent upon the purity of the air and the hours per day that can be spent out of doors in its influence. Even a temperature at zero is not injurious if proper clothing is provided. Other surgical conditions requiring fresh-air treatment are tuberculosis of the glands, kidneys, testes, prostate, peritoneum, etc.

The combination of sunshine, fresh air, rest, and fixation of a diseased joint during the active and painful stage when confined to bed is important to prevent the addition of mixed inflammatory infection to the tubercular process. In young children this treatment is best accomplished by placing the little patient upon a canvas-covered stretcher frame of bamboo, wood, or gas-pipe, from which it need not be removed day or night. Even a nursing baby can thus be gently cared for with the least possible movement of the diseased area. An older child can also be thus carried about the house by one or two persons, lifted upon a go-cart or wheeled litter or express-wagon, or placed on trestles or stools on a veranda or under a tree without changing the horizontal position or removing the pulley extension, or interfering in any way with an open-air life. When the painful stage has passed, ambulatory treatment on crutches can be commenced, the involved joint being fixed and protected by gypsum, leather, or binder's board splint or steel apparatus, with high cork shoe on the well foot.

For the wealthy, the problem is not difficult. The mountains, the seashore, the Adirondacks, the dry sunny slopes of the Rockies, the hills and plains of Europe and other countries, with comfortable sanatoriums and the advantages of change of location, are readily obtainable, and under judicious advice and treatment by a wise orthopedic surgeon hundreds of joints can be saved from life-long deformity. California has a large reputation in the treatment of tuberculosis, but it is, of course, necessary, as in Colorado, Arizona, and other sections, that judgment should be used in the selection of a proper region. California is such an enormous State that extreme diversities of heat and cold, dryness and dampness, are to be found. In the northern citrus belt, high upon the Sierras, 100 miles from San Francisco, many tuberculous patients find not only healthful surroundings, but are able also to maintain a profitable existence.

As 90 per cent. of the cases, however, are poor, the financial question presents a most serious problem to be solved in the treatment of this class. Children with bone or joint diseases in the large cities, with parents barely

able to earn enough to supply food and clothing, probably consumptive and living in closely crowded quarters, must be removed to healthful surroundings if lives are to be saved. Also the large number of adolescents and adults with tuberculous bone diseases must be provided for. When they are dependent upon their own exertions for a living, or have others dependent upon them, to advise them to go to Arizona or Colorado is to recommend the impossible.

Orthopedic Hospitals.—For this class, orthopedic hospitals of large accommodations, thoroughly equipped with appliances, and attended by surgeons specially conversant with the needs of these cripples, are all important. In addition, each State should provide surgical sanatoriums of large size, in carefully selected regions, at both mountain and seashore, and separated from lung cases.

Hospitals for children with tuberculous bones and joints should be separate from general surgical wards, as the great danger in suppurative cases is from the mixed infection, which destroys so many lives. The presence of this class of cases among fresh osteotomies, tenotomies, and other clean wounds, is also dangerous. Dressings saturated with tuberculous pus should be at once burned or disinfected. Adolescents and adults of this class should also be separated from general surgical wards. Another important reason for orthopedic hospitals thoroughly equipped and attended by surgeons especially trained for this work is the fact that these patients, being usually chronic cases, are apt to be neglected in the rush of active general surgical work.

Sun Porches, Solaria, Roof-gardens.—In the cities, hospital wards should be built to open south, east, and west, to admit both sun and air. At the south end should be built the most important part of the ward, *i. e.*, a porch sufficiently large to accommodate all cases confined to bed. If no thresholds are made, and if beds are provided with five-inch wheels, these beds can be rolled into the ward as necessary for surgical dressings, etc. The porch should be one-half covered, glass-inclosed in winter and provided with moderate heat, so that an abundance of cold air can be admitted.*

For patients lying in bed upon a porch the wooden wainscoting should reach in height to the bottom of the mattress, to keep out cold and wind. For twelve inches above this the sides should be of glass, to permit the child to look out upon the grass and trees, even when lying flat. Above this, every alternate glass sash should be hinged so as to open inward, and be fastened flat against its neighbor with hook, or else hinged above. If the frames are removed in summer, awnings should be erected to protect from wind and excessive sun and from rain during thunder-showers. This method will permit the use of netting to protect against mosquitos and flies, especially in

* Willard: Trans. Amer. Orth. Assoc., 1898, Orth. Dept. University Hospital.

malarial regions. One portion should be without roof, where diseased joints may be fully exposed to the direct sun-rays. Eyes can be protected by colored glasses or by a small doll's carriage green umbrella, attached to the head of the bed. Upon such a porch the children should sleep winter and summer, night and day, abundant clothing being provided. Separate screens or canvas curtains should be provided. The night nurse in charge can remain in a warmer room and watch the children through a glass partition, and when necessary, the bed can be rolled into the ward.

When such a porch is impossible in a city hospital, a roof-garden, one half covered, the other exposed, reached by elevator, is an excellent substitute, and will answer both for a sleeping porch and a day playroom. Private houses can be readily built with such an outing space. A balustrade to prevent accidents and glass inclosure in winter permit use during the entire year. If the hospital grounds are large, tents or shacks may be erected.

Sleeping out of doors, like all other matters, must be wisely and judiciously planned and provided for. At first every precaution must be taken to guard the patient from too sudden exposure and change. In the case of patients confined to bed, as in severe suppurative lesions of the spine or other joints, it is important that means for surgical dressings, cleansing, bathing, etc., shall be provided in a warmer atmosphere. It is for this reason that tent life is not as convenient as a porch or shack connected with a warm room into which the bed with large five-inch wheels can be easily rolled. If this is not possible, a small patient can be readily moved if laid permanently upon a canvas-covered gas-pipe frame, and placed upon a wheeled litter, go-cart, express-wagon, or cart. Cases able to move about on crutches or apparatus can be readily managed.

To be entirely in the open air is to avoid drafts and colds, but so long as thunder-storms, snow, rain, etc., must be provided for, the porch offers the best solution of the difficulties, especially for helpless patients.

A *canvas tent* theoretically is excellent, but practically it is very hot in summer days, even when covered with a fly, and unless floored and sides raised, it is damp in wet weather and does not give free circulation of air. In winter, if closed and provided with a stove, it is stuffy and ill ventilated. The disposal of feces and the arrangements for bathing, surgical dressings, etc., are also more difficult in a canvas tent for bed cases. The wooden barracks or shacks used at tuberculosis sanatoriums are much better. The best method in summer for convalescent cases who are old enough and well enough to become ambulatory would be to sleep in the open, with a tent in close proximity for escape during rain. A bed out of doors can be made much warmer by placing beneath the mattress several layers of wrapping or builder's paper, or even newspapers.

Convalescent Hospitals.—The site of convalescent hospitals must be selected with a view to healthful surroundings and for accessibility by skilled orthopedic surgeons.

An excellent type of this class is seen at Wellesley Hills, near Boston, as planned by Burrell* and others. These wooden shacks or barracks are inexpensively built, with glass sides and sunny playrooms, and open freely at the sides and roof.† The temperature at night sometimes falls to zero, but as the protection of the children is abundant, they are steadily improved in color, appetite, weight and strength, while hemoglobin is increased.‡ The clothing at night in the shack, if needed, is: shirt; Canton-flannel nightgown; red flannel jacket; long Shaker-flannel gown with hood; socks (or long boots made of eiderdown), reaching above the knees; six or eight blankets. There is no difficulty in keeping a patient comfortable with a temperature of 10° to 20° F. if abundant clothing and a nightcap are used. All that is necessary is that the nose be uncovered to receive the pure cold air. A down quilt is light and warm, and if perforated, does not induce perspiration.

Urination in boys is readily managed beneath the covers, and also in girls, if a small pus-basin is used. A skilful nurse can also change diapers quickly without exposure.

Extreme cold, however, is not important. It is fresh pure air that is needed, and this can be obtained by admitting it in abundance and yet tempering it by heat.

Barracks, or Shacks, or Bungalows, or Cabins, or Lodges.—For two persons well enough to assist themselves, the simplest and most effective form of shack is a small light wooden structure raised on supports, and with all four glass sides hinged at the upper border, to be raised outwardly so as to act as sunshades by day and to be open at all times except in rain or snow. Inside nettings will protect from mosquitos. An open porch can be added. Newspapers or rubber cloth beneath the mattress will add greatly to the warmth of the bed. A nearby earth-closet is, of course, convenient. An adjoining tent furnishes a good bath-room for the summer. For extremely windy nights in winter, inside denim or Japanese curtains can be arranged.

Industrial Schools.—In the Widener Industrial School for Crippled Children in Philadelphia the children spend a large portion of the time day and night in the open air; good food is given, and teaching is conducted as much as possible out of doors. Outdoor sports and occupations are encouraged as much as possible. The improvement in flesh, color, and health

* Burrell: Trans. Mass. Med. Soc., June, 1903.

† Thorndyke: Orthopedic Surgery, 219. Adams: Boston Med. and Surg. Jour., 1906, cliv, 71.

‡ Bradford: Tuberculosis in Massachusetts, 1908; Report Mass. State Com., 1908, pp. 99–114.

Fig. 2.—Widener Memorial Industrial Training School for Crippled Children. Administration building, main building, cottages—looking southwest.

is remarkable. Although the school is on the outskirts of a large city, 30 acres of ground are occupied. For a winter playground a large area is asphalted in order that it may be quickly cleaned of snow and dried. For shelter, a pavilion with glass roof and sides gives full access to the sun, and toilet-rooms for girls and boys are provided. The school provides hospital treatment with educational and manual training until the cripple arrives at the age of twenty-one, or has secured a self-sustaining occupation.

Forest Schools.—For feeble children, forest schools should be inaugurated where instruction can be given to the children with their lungs filled with pure air and their brains supplied with well-oxygenated blood. Undoubtedly, learning under such surroundings would be both rapid and attractive. Studies in natural history, of birds, animals, trees, plants, rocks, etc., would be simple and easy, and dangers of contagion would be lessened and a more vigorous youth-life secured for both sexes. The pallid city child under such conditions would soon evidence renewed color and vigor of resistance. To the teachers, also, such a system would add greatly to their physical being and their brain alertness and interest. Protection from rain would be the only question to be solved during the summer months. Seats and desks could be covered with a tent. The German Waldschule are a good type.

Sanatoriums.—Sanatoriums for surgical tuberculosis should be entirely separated from institutions designed for phthisical cases. They should be provided by each State at both seashore and mountain; should have large accommodation, but with many small wooden buildings. The surroundings should be healthful, and if possible in a pine forest region.

Pennsylvania last year appropriated $1,000,000 for the establishment of tuberculosis sanatoriums and dispensaries. One-story cottages, 27 by 24 feet, to accommodate eight patients, well ventilated and arranged with protection from storm, were erected. The cottages will face southeast to secure the greatest possible amount of sunshine on all four sides. Surgical tuberculous cases will, of course, be separated from lung patients. Exercise, amusements, and work will be appropriately regulated to the capacity of the individual.

Sanatoriums have now been largely established, however, for medical cases in Pennsylvania, New York, Vermont, Massachusetts, New Jersey, Iowa, Missouri, Maryland, and in other States; but separate institutions for the surgically tuberculous are only now being located.

Sanatoriums are of especial value in the early stages of joint or bone tuberculosis in proportion as they educate patients to lead a regulated and healthful method of life in the sunshine and open air, day and night; to take a proper amount of health-giving food; to sleep much and to give absolute rest to the diseased area. God's sunshine and God's pure air,

wherever obtained, with regional tissue rest, are more potent than all other forces combined.

Sanatoriums for joint cases require smooth grounds, as many patients are upon crutches or splints and cannot move about except upon level firm surfaces, thus preventing life in the woods, where the ground is soft and rough.

When surgeons and patients realize that 25,000 doses of pure air per day are infinitely better than three doses of nauseous drugs that impair appetite and digestion, then will the control of surgical tuberculosis be well advanced.

Probably the most improvement would be gained in the mountains for six months in summer, the winter months being passed at or near the seashore in warm regions, where ample porches and smooth boardwalks would permit a constant open-air life.

As cleanly surgical attendance is necessary, each sanatorium should be provided with an aseptic operating room and an equally clean room for surgical dressings.

Sleeping Tents and Canopies.—Sleeping tents and canopies are useful for patients who cannot secure an outdoor porch.

Another method is by the *window tents* that are now largely manufactured. These tents are so arranged at the window that the patient's head is outside the door, while the body is within,* or a cot can be so constructed on wheels that the head of the patient can be pushed outside the window line at night, and withdrawn in case of rain or snow, or an awning (without fringe) may be placed over the window. The window can be brought down close to the body of the patient and air excluded from the thorax by a loosely tucked blanket or by flannel. A woolen nightcap is desirable.

"Sending the patient to the country" will accomplish but little unless locality, environments, and food facilities are carefully considered by the surgeon. Many country houses are notoriously unhygienic in their surroundings. Abundance of sunshine, good food, pure air free from dust and smoke, and a life of moderate and systematic exercise that will tire, but not exhaust, are good rules.

Home Treatment.—When it is impossible to remove the patient from home, conditions can be greatly benefited by a wise and judicious system of supervision. The coöperation of surgeon, nurse, and visitor is important in the instruction of patients as to detail of daily life. Frequently it is impossible, among the poor, to secure outdoor sleeping. Under these conditions the best obtainable quarters will be a room with as many windows as possible for the night, and a southern exposure, if feasible, by day. Unfortunately, it is often impossible for the family to supply sufficient heat or bed-clothing in winter, with the result that all huddle together in close quarters. Careful

* Harris Window Tent; Walsh Window Tent, Morris, Ill.; Do-wah-jack Portable Co., Chicago.

instructions as to habits, food, air, etc., will change doubtful cases into hopeful ones. The diet must be nutritious and easily assimilated,—milk, eggs, meat, bread; as much butter as can be afforded (in place of cod-liver oil), fruits, fats, proper hours of rest, etc.

Fresh air at night can be secured by placing the head of the bed at an open window, the head being protected by a handkerchief or nightcap. The body can be shut off from the head by curtains tacked to the sides and top of the window, or supported on wire or wooden frames, and tucked about the neck and chest.*

For a patient in a family of even moderate circumstances in the country or in a village, with space between the houses, or even on the roofs or the yard of city houses, much can be accomplished toward providing an outdoor life. Any sunny room or yard or open porch covered with roof or awning offers excellent facilities. A cheap balcony, with awning, a flat roof or a flat platform over a sloping roof, can be constructed at slight cost.†

The principal difficulty is to provide against thunder-storms and wind in summer and rain and snow in winter. On account of this a porch is better than a tent, as screens and awnings are more easily adjusted. A child, if confined to the recumbent position, should be continuously on a bed-tray or frame for convenient moving. A tent in a yard is useful, but if closed, is no better than a room. For movable cases a nearby shade tree is refreshing in summer. An army tent, 7 x 7 feet, with fly, can be procured for seven or eight dollars. An open shack is useful, but is not so easily moved for summer and for winter use as is the tent.

Day Camps.—Even day camps situated within easy access from the larger cities are serviceable according to the degree to which they can be utilized. Even a few hours of breathing pure, healthful, life-giving air is infinitely better than living continuously in crowded alleys and rooms.

Walking cases of joint tuberculosis can be benefited just in proportion to the hours that they can be brought into contact with hygienic surroundings; *i. e.*, provided the joints are protected against traumatisms en route. Sanatoriums, if properly located and scientifically conducted, should yield 10 per cent. better results than day camps, and the latter 10 to 20 per cent. better results than home treatment, especially in tenements.‡

Food.—One of the important elements of the outdoor life is its stimulating effect upon appetite, nutrition, and assimilation. Any medicine that interferes with digestion should be omitted or regulated. Creosote, if administered, should be given in pepsin or in peptonoids. A few drops of ether will correct the regurgitations after cod-liver oil. Pepsin is valuable

* Jour. Amer. Med. Assoc., Dec., 1907.

† Jour. Amer. Med. Assoc., 1907, xlix, 9, 755; Boston Med. and Surg. Jour., Feb., 1906.

‡ The early labors of Bennett, Hutt, and others are yielding excellent fruit.

in assisting comfortable retention of food; so are the mineral acids and nux vomica—the latter much better than strychnin. Milk, buttermilk, whey, junket, custards, koumis, eggs, raw or heated in a glass of boiling water, meats, especially fat, and in some cases the concentrated beef and alcoholic foods, will be found useful. Syrups, cod-liver oil, etc., are very apt to disturb the appetite. Butter in large quantities, for those who can afford it, is better than cod-liver oil, much pleasanter, and less liable to disturb digestion. When milk is distasteful, its relish can be cultivated by adding a pinch of salt or by feeding the child a bowl of bread and milk daily, a tablespoon being used, so that the mouthful should consist of a large amount of milk, not merely soaked bread, as is the case when a teaspoon and small cup are used.

El Tratamiento al aire Libre de la Tuberculosis Quirúrgica.—(WILLARD.)

En la tuberculosis de los huesos y de las articulaciones, lo mismo que en los casos médicos, la vida al aire libre, de día y de noche, es un factor esencial en el tratamiento.

El diagnóstico prematuro, el tratamiento al aire libre, los rayos del Sol, aire puro, descanso y la aplicación apropiada de los procedimientos mecánicos y quirúrgicos, puden prevenir y aun curar sin deformidad una gran parte de los casos de enfermedades de las articulaciones—25,000 dosis de aire puro en 24 horas infinitamente mejor que tres dosis de una droga que produce nauseas, y desarreglos de la digestión.

La temperatura baja es detrimental al bacilo. El frío aumenta el apetito, la nutrición y la circulación, predispone al ejercicio y al sueño, dá buen color, aumenta el peso, las fuerzas y la hemoglobina de la sangre. El cambio de las orillas del mar á las montañas es deseable; 90% de los casos de las afecciones de las articulaciones pertenecen a la clase pobre.

Necesidad de separar los casos de tuberculosis pulmonar y de tuberculosis quirúrgica en los sanatorios y hospitales. Construcción de los sanatorios y hospitales de un modo tal que las camas puedan moverse fácilmente dentro ó afuera de las ventanas, dando asi cuarto caliente para las operaciones y cuidados posteriores. Asepsia para la prevención de las infecciones mixtas. La afección de las articulaciones requiere muletas al nivel del suelo. Tiendas, calientes en el Verano, frías en el Invierno. Cuarteles abiertos. Pórticos espaciosos para las camas conectados con cuartos privados ó con las salas de los hospitales—abiertos en el Verano—con vidrieras en el Invierno—Ventanas grandes, armadura de las camas. Litras con ruedas. Biombos, sombras; jardines en el techo. Tormentas. Cabañas portátiles. Campos diurnos cerca de las ciudades; Escuelas de campo para los pacientes con tendencias

hereditarias. Tratamiento en el hogar. Ventanas abiertas, la cabeza fuera de la ventana—Protección contra el frío, papeles debajo de los colchones, ropa suficiente, buena alimentación, cuidado en la selección de las condiciones. Casas de campo insalubres.

DISCUSSION.

Dr. John M. T. Finney (Baltimore) said the Johns Hopkins Hospital had been a pioneer in this country in advocating the outdoor treatment of surgical tuberculosis. In the early days of the hospital Dr. Halsted had insisted in keeping these cases out of doors. The results had been most satisfactory.

Dr. R. W. Corwin (Pueblo, Colorado) believed that all cases should be treated in the open air. There are only two reasons why hospitals for tuberculosis have not been taken to the country, and these are ignorance on the part of municipal authorities and because doctors were too lazy to go out into the country.

Dr. Willard, in closing, said that in his experience lung tuberculosis occasionally occurred after tuberculosis of the joints, but rarely. The majority of his fatal cases were due to tuberculous meningitis, and not to secondary lung tuberculosis.

TUBERCULOSIS OF THE URINARY TRACT.

By Thorkild Rovsing, M.D.,
Professor of Clinical Surgery at the University of Copenhagen.

Remarks on the Diagnosis.

Tuberculosis of the urinary tract, in by far the greatest number of cases, proceeds from the one kidney, and the chances for complete recovery in such cases of surgical means, are, as a rule, the best possible, provided the diagnosis is made at a sufficiently early stage, that is, before the tuberculosis has spread to the bladder and beyond. But the diagnosis, alas! is but too often made at an exceedingly late stage, which fact will be brought home to you when I tell you that out of my 162 patients, 30 were absolutely too far gone for operation and in an utterly hopeless condition, and that no less than 42 (39 per cent.) of the patients, where I still found indication for nephrectomy, had already tuberculosis in the bladder.

What are the causes of this deplorable fact? In a certain number of cases cystitic symptoms, as a matter of fact, are the first thing which show the patient that he is ill and take him to the doctor, and under these circumstances, therefore, the latter is blameless. But in many cases—about 60 per cent. in my statistics—pains in the region of the kidneys, emaciation, weariness, turbidness of the urine, have, long before the bladder symptoms set in, caused the patient to consult a doctor, who has then made a wrong diagnosis. The wrong diagnosis is most frequently nephritis, under which diagnosis many of my patients have been treated for a lengthy period, even by clever doctors and, worse still, in medical hospital wards. In the urine, which is often but very slightly turbid, the ordinary chemical tests show a faint or medium albumin reaction, which is diagnosed as arising from a nephritis, and a rigorous diet—milk, milk foods, and fish are then ordered—a fatal mistake, especially here, because the patient's power of resisting the tuberculosis is materially weakened by this protracted scanty fare, and the disease advances rapidly.

Then there are cases where the urine contains visible pus and where the diagnosis is pyelitis, and the patient is then treated with salol, boric acid, or similar remedies. But even the appearance of cystitic symptoms does not by any means always bring the doctor on the right track; the only result is that he often, without a more thorough examination as to what form of cystitis he has here to deal with, blindly attacks, so to speak, the disease

with the ordinary cystitic remedies, such as lapis instillations, which are exceedingly painful, entirely useless, and often apparently aggravate the cystitis. These patients are in a still worse plight if, a short time previously, they have been suffering from gonorrheal urethritis, because the cystitis is then taken to be gonorrheal and treated with protargol or, what is still worse, with the Janet daily lavage with a solution of permanganate of potash, which appears to have a particularly injurious effect upon the mucous membrane of a tuberculous bladder; this treatment, in any case, appears to have had a fatal influence in two of my cases.

All these regrettable erroneous diagnoses might be avoided if only doctors fully realized that one ought never to begin the treatment of albuminuria, pyuria, or cystitis without first having subjected the urine, sterilely taken from the bladder, not only to a chemical, but also to a microscopical and bacteriological, examination.

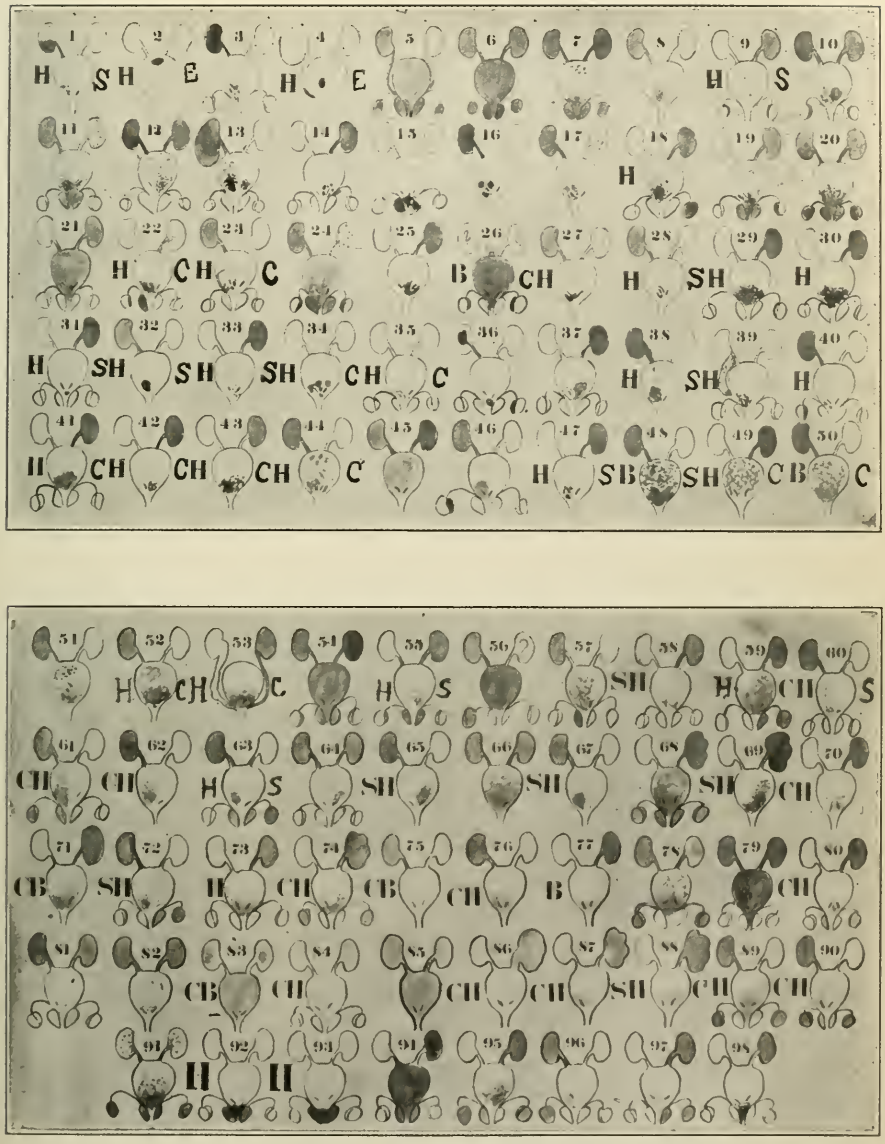
I am quite aware that it is maintained to be very difficult to prove the presence of tubercle bacilli. Even in the newest hand-books, such as Küster's and Wagner's, it is stated that, to show the presence of tubercle bacilli in diseases of the urinal channel only succeeds in 10 to 20 per cent. of the cases. With reference to these statements I can only say that the gentlemen in question must have adopted unfortunate methods or have not persevered long enough, for when I make up the statistics from all my cases, it appears that the presence of tubercle bacilli has been successfully shown in 80.7 per cent. of these cases. The method which I have used with such good results is that of Forsell, according to which one lets the aggregate urine of the twenty-four hours precipitate in a separatory. The lowest portion of the precipitate which contains the tubercle bacilli is separated and can then, in addition, be centrifugally treated before being examined microscopically.

For a practitioner all such circumstantial methods, as a rule, are entirely unnecessary, for simple microscopy with ordinary microbe coloring is sufficient to give him the diagnosis: if he finds pus in the urine but no microbes, the diagnosis of tuberculosis is almost certain; the case is anyhow so suspicious that the patient must at once be sent to a place where a special examination by experts can be undertaken; for in all suppurative kidney affections we find numerous easily colored microbes in the urine.

When we are certain, or at any rate have a strong suspicion, that it is a case of tuberculosis of the urinary organs, it is necessary for us accurately to define the seat and the extent of the tuberculosis. Is the bladder tuberculous, and if so, by ascending or descending infection? But the question as to what should be our principal method of deciding these vital points is a subject of strong disagreement among medical men all over the world, as Luys' and Cathelin's so-called urine segregators are being advocated in preference to cystoscopy and ureter catheterization.

The use of ureter catheterization, more especially in tuberculosis of the urinal organs, has many enemies, no doubt principally on account of the art of ureter catheterization being so difficult to learn, and requiring so much time, but also because one is afraid of infecting the possibly sound ureter, and even if we maintain that this risk, as far as experience shows us, is very slight, yet its existence cannot be denied, and it would be desirable if we could manage with cystoscopy alone or with segregators. According to my experience, this, however, is entirely impossible, and with your permission I will lay my proofs, which you will find in the graphic diagrams of the cases complicated with bladder tuberculosis, before you. Cystoscopy pure and simple is always uncertain; in some cases we can, of course, see undoubtedly purulent urine flow from the orifice of the ureter and thus obtain tolerable certainty of the kidney in question being affected, but we are then left entirely in the dark as to the state of the other kidney, for a macroscopically clear urine is not by any means synonymous with a normal urine. Cystoscopy, generally speaking, should enlighten us about alterations in the shape of the orifice of the ureter, swellings, miliary tubercles, and ulceration around the diseased orifice of the ureter. But if you will be good enough to look at this table, where every case is represented by a drawing which shows the area of the tuberculosis in the urogenital organs, you will find that the tuberculous alterations in the bladder in only a minority of the cases are localized around the diseased ureter. In some cases you will see that the bladder tuberculosis, in a directly misleading manner, has localized exclusively round the orifice of the sound ureter, as in cases 18, 42, 47. You will find cases where both the kidneys are affected, but both the ureteric orifices are free from alterations, or where the tuberculosis has localized around the orifice of the one ureter, but in by far the greatest number of cases you will see that bladder tuberculosis in one-sided kidney affection is spread over both sides or halves of the bladder, sometimes over the whole of the mucous membrane of the bladder (see cases Nos. 5, 6, 13, 18, 21, 24, 26, 29, 30, 41, 43, 44, 48, 49, 50, 51, 52, 53, 54, and 56).

But if this capricious spreading of the bladder tuberculosis makes the deductions which you can draw from simple cystoscopy most unreliable, its effect upon the results obtainable by means of Luys' and Cathelin's segregators are still more fatal, for it is a matter of course that in all those cases of one-sided kidney tuberculosis with an opposite or extended localization of bladder tuberculosis purulent urine containing tubercle bacilli will be drawn from both the tubes of the segregator, and thus wrongfully lead to the diagnosis of double kidney tuberculosis, where in reality it is a case of only one-sided kidney tuberculosis. This is the more serious because this mistake will never be brought to light to a doctor depending upon the segregator, for the patient will be sent away as unfit for operation, and when



Tubereulosis of the Urinary Tract (Rovsing).

B, Better. H, Healed. C, Carbolic treatment. S, Spontaneous. E, Extirpation.

in due course he succumbs to his disease, it only seems to confirm the erroneous diagnosis. Thus by using this method we run the risk that a certain number of patients who could have been saved by nephrectomy are left to their fate.

Therefore this method ought not to be allowed to take the place of, or be put on a level with, the ureter catheterization, which is the only bloodless method which can give us certain knowledge of the state of the kidneys, and it is necessary to warn against the use of segregators which are so tempting because of the technical simplicity of the method which any one can apply, while ureter catheterization requires special training and practice.

The examination of the urine taken from each kidney must be undertaken with great care and judgment; it must be subjected to a thorough chemical, microscopical, and bacteriological examination. If we were to content ourselves with a chemical analysis of the urine from each kidney for albumin, we might in some cases be led to suppose we had a case of double-sided kidney tuberculosis where, in reality, it was only one-sided. It is of less importance that an albumin reaction can be owing to a mixture of blood in the otherwise normal urine caused by a traumatic injury to the mucous membrane by the point of the catheter, because in most cases one will observe the sudden blood color in the urine, but in order to make certain that the bleeding has not been caused by the ulcerated state of the mucous membrane, the urine must be subjected to careful microscopical examination. It is of greater importance to know that with severe tuberculosis of the one kidney one can have real albuminuria from the other, without this signifying that the latter, too, is tuberculous. In this instance it is a case of toxic albuminuria which is caused by the blood having absorbed poisonous substances from the tuberculous kidney, and as such toxic albuminuria, instead of counterindicating an operation, requires, on the contrary, a speedy extirpation of the tuberculous kidney from which the poisoning proceeds, it will be easily apparent how important it is to be able to discern between the former and the albuminuria which indicated the commencement of tuberculosis in the other kidney. This can only be done by careful microscopic and bacterioscopic examination of the albuminous urine. If this does not contain any or only contains very few leukocytes and no bacilli, then we have to deal with a toxic albuminuria, while a real tuberculous kidney affection will always show numerous leukocytes and most frequently easily discernible tubercle bacilli, for the more recent the tuberculous affection, the more numerous the bacilli. At the congress of surgeons held in Berlin in April, 1905, I, for the first time, drew attention to the importance of this diagnosticating toxic albuminuria, and in my introductory address to the discussion on nephrectomy in kidney tuberculosis, I mentioned five such cases where I, in spite of a fairly pronounced albuminuria from the

other kidney, had extirpated the tuberculous kidney, and afterward seen the albuminuria disappear in the course of a very short time, the patients being cured. To this, from subsequent personal experience, I can add six new cases, and Albarran has recently published some cases of a similar nature.

These cases show better than anything else the supremacy of ureter catheterization from a diagnostic and prognostic point of view, but, unfortunately, there are cases where this examination is confronted with insurmountable obstacles, and this is more especially the case where the bladder, too, is attacked by tuberculosis. In the first place the irritability of the bladder with widespread ulcerated cystitis can be so great that cystoscopy is altogether impossible, as the bladder cannot contain the necessary quantity of fluid. Secondly, there are cases where cystoscopy would otherwise be practicable were not the ureteric orifices so buried in ulcerations and swellings that it is impossible to insert the catheter. A valuable aid in finding the mouths of the ureter in such cases is Voelker's so-called chromocystoscopy, the indigo-carmin colored urine showing us the way, but the ureter catheter is often stopped at once or a little inside the mouth by a stricture which thus prevents us from obtaining urine. In about one-third of the cases complicated by bladder tuberculosis I have been obliged, for these reasons, to abandon ureter catheterization. In not a few cases this method of examination fails even for an experienced cystoscopist. Shall we then leave such patients to their uncertain fate, or have we other means of preventing surgeons from committing the surgical error of extirpating the one kidney when the other is also attacked and functionally incompetent? In my opinion, there is only one fairly reliable means of attaining these ends, namely, my double explorative lumbar incision brought out in the year 1894, by which, at the same séance, I lay bare both kidneys and subject them to a thorough inspection and palpation. If I find the one kidney, or possibly the ureter, much affected by tuberculosis, while the other kidney and ureter show normal conditions to the touch and the eye, I can with confidence extirpate the tuberculous kidney, for even if this examination does not to a certainty exclude the presence of a small tuberculous focus in the apparently sound kidney, one can make sure of its being capable of function. Under such circumstances it is always of great importance to draw forward the ureter on a finger for a minute examination, for in cases of ascending tuberculosis the kidney may still be quite sound both to the touch and the eye—it is only the enlarged and distended ureter which betrays the presence of the disease.

The double lumbar incision has been used by me in 22 cases, and I have never lost a patient by this method. In 14 cases I ascertained the one-sidedness of the disease, which could not have been ascertained by any

other means. I removed the diseased kidney, and in all cases recovery was the result. In 8 cases I ascertained the double-sidedness of the disease; in 5 of these I closed again without proceeding further. In 2 cases I undertook ureterostomy to procure relief from pains and to arrest the process of ascending tuberculosis; in 1 case I punctured an abscess in the kidney as large as a hen's egg.

It may have surprised you that I have not so far touched upon the importance of the different so-called kidney-function examinations for ascertaining the condition of the other kidney prior to nephrectomy. My reason is that many years' experience and examinations, for which I and my assistant, Dr. Koch, have fully accounted in previous publications, have shown me that nothing reliable can be based upon these examinations, because the capacity of the kidney cannot at all be gaged by the work of secretion done at the moment, and which is dependent upon a number of factors.

I have, ever since 1892, systematically undertaken quantitative analyses of urea with all my kidney patients prior to operation, and found that a normal secretion of urea is a safe criterion of a sufficiency of kidney tissue capable of function, but that, on the other hand, nothing can be gathered from a reduced secretion, inasmuch as the latter directly or indirectly can be owing to the diseased kidney—directly, by a purely reflex effect upon the secretion of the sound kidney (reno-renal reflex); indirectly, by the disease actuating the functions of the whole organism. I have shown this in a whole series of cases in which the secretion of urea, after the removal of the tuberculous kidney, from being minimal quickly rose to a normal height. While a normal secretion of urea imparts a very important and satisfactory knowledge, it is, on the other hand, very risky to adduce from a slighter secretion of urea that both kidneys are inadequate. This may serve as a warning to proceed cautiously, but nothing beyond that.

With regard to all the rest of modern kidney-function examinations, I have shown that these are still more unreliable than the urea analysis, for while the latter only misleads by a negative result, both chromocytoscopy (Achard's methylene-blue test, Voelker's indigo carmin), cryoscopy, and the phloridzin method are capable of misleading by positive as well as negative results. I have, therefore, entirely given up these artificial and complicated methods in favor of the simple and rational quantitative urea analysis, which I make by the aid of Esbach's ureometer.

Prognosis and Treatment.

The great change in our conception of the pathogenesis of the disease, to which I have referred, and the great advance we have made in diagnostic skill, have also caused a happy change in the treatment of urogenital tuber-

culosis and its prognosis. The old pessimistic conception of the prognosis and the consequent passive position, therapeutically, has given place to a more hopeful prognosis.

If we should define the status of the question at the present moment, I consider that, generally speaking, I can maintain that the possibility of a radical cure is dependent on two conditions: first, that the point where the tuberculosis originates within the urogenital organs can be radically removed; and, second, that at least the one kidney is sound.

As far as the descending tuberculosis of the urinary tract is concerned, these two conditions, of course, go together: if only the one kidney is attacked, there are chances for a cure by nephrectomy. With ascending urogenital tuberculosis both conditions have to be reckoned with, inasmuch as the tuberculosis here originates in the genital organs, but often secondarily spreads to the kidneys. This doubly complicated condition makes the prospects of a cure considerably slighter with ascending urogenital tuberculosis. As I, in my introductory remarks, had the opportunity of proving from my material, the prognosis for ascending urogenital tuberculosis is in reality much slighter than for descending. This is partly owing to the fact that while primary kidney tuberculosis in the great majority of cases is one-sided, secondary kidney tuberculosis is just about as often double-sided as one-sided, and partly to the desperate course which a breaking through of the tuberculosis from the prostate to the bladder and urethra most frequently takes, attended by uroplany extravasation, fistula formations, etc.

If, on the other hand, only the epididymis, vas deferens, and a single kidney are attacked, there is every prospect of a cure through the removal of the epididymis and the diseased kidney, even if the bladder should be also attacked. This latter complication, up to a few years ago, was considered so serious that it was looked upon as an absolute counterindication against operation. We know now, through numerous instances, that a slight bladder tuberculosis is frequently cured spontaneously when the original focus is removed, but even with extensive bladder tuberculosis, which excludes a spontaneous cure, there is every chance of bringing about a cure by treatment with 6 per cent. solution of carbolic acid, with which, up to the present time, I have cured 24 patients.

In all the cases where, by means of the diagnostic aids which I have just described, I have proved that only the one kidney was attacked, I have removed it by nephrectomy. All told, I have performed 106 nephrectomies for kidney tuberculosis with but 6 deaths, that is, 5.7 per cent. mortality. There were 2 deaths in the first 14 cases, which were performed before 1901, consequently 14.2 per cent. mortality, while there were only 4 deaths out of the 91 nephrectomies performed after 1901—that is, 4.3 per cent. Considering how exceedingly far advanced the disease was in the majority of

these cases, I think we may look upon this as a very low mortality, and as I am of the opinion that this result is owing to the method according to which I have invariably operated during the last seven years, a short description of this method may be of interest to you. My principle is to remove the kidney as a closed whole, so that no tuberculous virus can have a chance of infecting the lumbar incision. I use an amply slanting lumbar incision, open the fat casing of the kidney at the back, loosen with great care by means of my rubber-gloved hand the kidney from its bed and possible adhesions, examine and palpate it minutely in order to verify the diagnosis, then draw the ureter forward on my bent left forefinger, tie it up in two places with strong silken thread, in order slowly to burn it through with red-hot thermocautery between the silk threads, about 3 centimeters beneath the entrance into the pelvis. I then isolate this from the vessels in the pedicle, which is tied up with strong formalin catgut, after which the kidney is removed by cutting through the vessels. The peripheral end of the ureter is fastened to the skin 1 centimeter from the wound-line, whereby I insure against any possibility of infection from tuberculosis. Formerly, when I removed as much of the ureter as possible and lowered the stump, the latter often became the starting-point for an exceedingly dangerous diffused tuberculosis in the retroperitoneal tissue and in the abdomen.

In case one or both the epididymides are attacked, an extirpation of the epididymis is performed at the same or a subsequent séance, with the preservation of the testis if the latter be not attacked. The severed vas deferens is treated as was the ureter: it is sewn forward to the scrotal skin, where it, when the sore is otherwise healed, is kept open as a safety valve for the tuberculous secretion, which might be in the peripheral parts and in the vesiculæ seminales. I have adopted this method in connection with nephrectomy in 21 cases, and always with good results. If there is tuberculosis of the bladder, I wait some time after the nephrectomy to see whether the bladder tuberculosis will heal spontaneously, which I ascertain by every fourteen days performing cystoscopy. In 14 cases spontaneous healing resulted simply in consequence of the source of the infection having been removed with the kidney. But in the remaining 25 cases there was no such spontaneous healing. Sometimes, contrary to what is generally the case, quite a small tuberculosis was seen to spread, assuming a very vicious character, but in these cases the bladder tuberculosis was, as a rule, already far advanced when the patient came into the hospital. These cases I have subjected to local treatment with 6 per cent. carbolic acid solution. This treatment, which, to begin with, is undertaken every other day, consists in first rinsing the bladder with sterilized water and then making an injection of 50 c.c. freshly made, warm, 6 per cent. carbolic solution; this is allowed to remain for two to three minutes and

comes away as a perfectly milky fluid. These injections are continued until the carbolic water comes away fairly clear. The effect of this treatment, which, as a rule, manifests itself quickly, is shown by the cessation of the pus secretion and the urine becoming clearer. By degrees, as the urine becomes clearer, the injections are made at longer and longer intervals and cease when it has been shown by cystoscopy that the mucous membrane of the bladder is healed. This we can see by the ulcerations in the cystoscopic picture being replaced by smooth mother-of-pearl like cicatricial tissue. With widespread tuberculosis a six to eight weeks' treatment is, on an average, necessary. If the patient and the doctor have the perseverance to carry through the treatment, a cure is certain, subject to two conditions: (1) that the source of infection is removed, and (2) that the tuberculosis is confined to the mucous membrane and has not spread through the walls of the bladder. It is only subject to these conditions that the adoption of this treatment can be at all recommended. The first patient treated in this way, and in whose case the tuberculosis was of an unusually vicious nature, and extending over the whole of the bladder, has now been well for five years. A drawback to this method is the considerable amount of pain which it entails; but one can materially ameliorate the pain by injecting cocain or eucain into the bladder, and, after the washing, giving the patient a suppository with opium or morphin. I have only seen isolated cases of carbolic poisoning: black urine, nausea and vomiting, but these symptoms quickly subsided. When it is made plain to the patient that this treatment is the only chance, and at the same time a very great chance, of saving life and health, he, as a rule, submits patiently to the pain.

I have of late gone still further in my attempts to save apparently hopeless patients, as, for instance, in the case I have already mentioned while speaking about the diagnosis, where the double lumbar incision showed me that the tuberculosis had proceeded from the completely destroyed left kidney, through the ureter, spread to the bladder, the mucous membrane of which was completely ulcerated, and from there had again ascended to the right ureter and there produced stricture and distention. In this case I performed extirpation of the left kidney and lumbar ureterostomy on the right side; by doing this I prevented the tuberculosis from ascending to the other kidney, which was still sound; I kept the fistula open until I had cured the bladder tuberculosis by carbolic treatment and widened the ureter stricture. The passage through the ureter was then reëstablished, and the patient is still, two years after the operation, living and free from pains of the bladder, the right kidney officiating satisfactorily.

As a palliative operation I use and strongly recommend ureterostomy in cases of double-sided, ascending kidney tuberculosis, where stricture with distention of the ureter and pelvis causes great pain. In such cases we not

only relieve the patient completely from pain, but, by establishing a free outlet, arrest the upward progress of the tuberculosis, and the patient's life is prolonged. Neither is it probably altogether out of the question that, at an early stage, an ascending kidney tuberculosis can be cured in this manner. Formerly I used a catheter or drain introduced into and fixed in the ureter, and which, through the bandaging, was carried to a concave-convex bottle which was tied to the lumbar region by a belt, but the frequent escape of the urine by the side of the catheter and the drawbacks resulting therefrom led me to construct a bandage consisting of a small silver capsule fitted with a rubber ring, and which, by means of an elastic girth around the abdomen, is kept tight around the ureter fistula, and from which a small silver tube through a drain leads the urine into a urinal.

Tratamiento de la Tuberculosis Renal.—(ROVSING.)

1. El peligro de infección por la orina tuberculosa no se estima bien ó se descuida.

2. El diagnóstico de tuberculosis renal es, como regla general, hecho despues de muchos años de enfermedad y solo cuando la vejiga ha sido afectada.

3. Hasta que aparecen los síntomas de la vejiga, el diagnóstico es nefritis, y el tratamiento por tanto enteramente diferente de la terapéutica racional.

4. La atención de los médicos debe concentrarse à hacer un pronto diagnóstico por el examen microscópico y bacterológico de la orina en caso de albuminuria.

5. Si se encuentra pus, sin bacteria en manchas, preparaciones y cultura, el diagnóstico de tuberculosis es casi seguro.

6. Hecho el diagnóstico debe tenerse cuidado de la ropa y la orina por sus propiedades contagiosas.

7. Los pacientes deben ser enviados á un circujano para la cistoscopia y la uretral cateterización, pues siempre hay una probabilidad de cura si un riñon está bueno; por nefrectomia del riñon enfermo, y si la vejiga está también afectada, puede tratarse con inyecciones de 5 per cent.–6 per cent. de solución de acido carbólico, según mi método.

Traitement de la tuberculose rénale.—(ROVSING.)

1. Le danger d'infection par l'urine tuberculeuse est trop peu estimé ou négligé.

2. En général le diagnostic de tuberculose rénale n'est fait qu'après plusieurs années de maladie, quand la vessie commence à souffrir.

3. Avant l'apparence de symptômes vésicales la maladie est méconnue; le médecin diagnostique une néphrite, et par conséquent le traitement qui est suivi est tout différent du traitement rationnel.

4. Nécessité d'attirer l'attention des médecins à l'importance d'une diagnose précoce à l'aide d'examen microscopique et bactériologique des urines, qui devrait se faire dans tous les cas d'albuminurie.

5. Si les urines contiennent du pus, sans qu'on trouve des bacilles à l'aide de l'examen microscopique et bactériologique, la tuberculose est presque certaine.

6. Vu le danger de contagion par les urines, surveiller celles-ci et le linge du malade dès que la diagnose a été établie.

7. Envoyer le malade au chirurgien pour la cystoscopie et la cathetérisation des uretères, puisque la guérison est toujours possible, pourvu que l'un des deux reins est sain, par la néphrectomie du rein malade. Si la vessie est prise, pratiquer des injections de solutions de phénol, à titre de 5 à 6 pour cent, selon la méthode de l'auteur.

Die Behandlung der Nierentuberkulose.—(Rovsing.)

1. Die Gefahr der Infektion durch tuberkulösen Urin wird unterschätzt oder vernachlässigt.

2. Die Diagnose der Nierentuberkulose wird gewöhnlich nur nach jahrelanger Krankheit gemacht, nachdem die Blase affizirt ist.

3. Bis die Blasensymptome einsetzen, ist die Diagnose Nephritis, und die Behandlung daher von der rationellen Therapie ganz verschieden.

4. Die Aufmerksamkeit des Arztes soll daher auf die frühe Diagnose gelenkt werden, durch mikroskopische und bakteriologische Untersuchung des Urins in jedem Falle von Albuminurie.

5. Wenn Eiter gefunden wird, und Bakterien in den gefärbten Präparaten und in Culturen vorgefunden werden, dann ist die Diagnose auf Tuberkulose nahezu sicher.

6. Sobald man die Diagnose gestellt hat, muss auf die Bettwäsche und den Urin achtgegeben werden, da sie ansteckend sind.

7. Die Patienten sollten einem Chirurgen für die Cystoskopie und Katheterisierung der Harnleiter zugeschickt werden, da sie immer Aussicht haben, geheilt zu werden durch Nephrektomie der erkrankten Niere, wenn eine Niere gesund ist; und wenn die Blase auch affizirt ist, kann diese durch Ausspülungen mit einer 5 Procent bis 6 Procent Carbolsäurelösung nach meiner Methode behandelt werden.

TUBERCULOSIS OF MUSCLES, TENDONS, AND FASCIA.

By James F. Mitchell, M.D.,
Washington, D. C.

We are accustomed to see the subject of tuberculosis of the skeletal muscles, tendons, and fascia dismissed with a few words, usually amounting to the statement that it does occur and is usually secondary to a tuberculous focus elsewhere. Careful search of the literature brings out the fact that primary tuberculosis of tendons is common, and that primary tuberculosis of muscles and fascia has been frequently described. The French seem to have been especially interested in tuberculosis of muscle whereas in Germany the tendons and fascia have received more attention.

Tuberculosis of Muscle.—Secondary tuberculosis of muscle by extension is very common. It is usually seen as a psoas abscess from a vertebral focus, as a pectoral abscess having its origin in a diseased rib, or it may occur as a direct extension in the neighborhood of involved bones or joints elsewhere. Primary tuberculosis of muscle is a much less common affair. It appears to have been first described by Habermaas and Mueller[1] in 1886. Since then the number of true cases reported is small. In a review by Kaiser,[2] in 1905, only eighteen are reported, and since this paper I can find reports of only three others. An attempt is made by several writers to explain the rarity of this disease. Plantard,[3] in an extensive monograph in 1901, refers to the work of Richet, explaining its infrequent occurrence in cattle as due to a definite germicidal action of muscle. Richet supposes in the muscle a tuberculous antitoxin, and emphasizes the fact that no one has ever observed a giant-cell within a muscle-fiber.

The disease is apparently almost symptomless, appearing usually in young persons as one or several nodules in the course of a skeletal muscle. Those muscles most exposed to traumatism are usually attacked. The early stage is rarely seen, and only noticed by accident. The nodules appear as masses in the substance of the muscle, usually oval, varying in size and elevating the overlying skin, which is not attached. They are more often multiple, and in consistence are hard, with a vague sensation of fluctuation. The tumor appears hard when the muscle is contracted, and softer when it is in relaxation. If the nodule has gone on to caseation and abscess formation, the appearance is that of a definite cold abscess. There is usually little pain

and no fever, the diagnosis being based most often on preëxisting evidence of tuberculosis, or the appearance of such masses in weak and tuberculous looking individuals.

Pathologically, the disease presents three types: the tuberculous nodule or gumma, the cold abscess, and the tuberculous muscular cirrhosis. These represent merely three stages of the same affection, the nodule being the early stage, the abscess a degenerating stage, and the cirrhosis a healing process. The infection is probably always a hematogenous one, and the establishment of a focus is due to the lodgment of tubercle bacilli in a small vessel having its final distribution in a muscle. The origin and extension of the process are in the connective tissue, and the statement is, therefore, made that there is no true tuberculosis of muscle, but rather a tuberculosis of the muscular connective tissue. Microscopically, a node presents three areas: an outer zone of practically normal muscle; a middle, in which the muscle-fibers are broken up and separated by connective tissue rich in cells, and a central zone where the muscle-fibers disappear and are replaced by tuberculous granulation tissue or caseous material. The muscle-fibers of the outer zone show their normal structure. As the granulation layer is approached the muscle-fibers show more and more alteration. Their thickness varies, some being larger than normal, others smaller, and in places the striations disappear. The hypertrophied connective tissue pushes in and separates the individual fibers. There is active proliferation of the nuclei of the sarcoplasm, which are arranged more or less in rows. In the granulation tissue numerous typical giant-cells are seen. It is still disputed whether or not these originate in part from the sarcoplasm. The central caseous mass shows fragmented nuclei and particles of degenerated muscle-fibers. Tubercles and giant-cells are seen partly in the large fibrous septa and partly in the finer connective tissue separating the muscle-bundles and individual fibers. The actual muscle changes then consist in a degenerative atrophy, the principal reaction being in the connective tissue. The connective tissue changes gradually lead to the formation of a thick, hard shell around the node, which may result in a spontaneous cure; or if the reaction is not so great, to the formation of an abscess. The appended table from Kaiser gives in detail the location of the disease in reported cases, with the treatment and its result. To this list may be added three reported in 1907 by Kirmisson[4] and Cornie,[5] bringing the number of reported cases up to twenty-one. In the available hospital records I can find no case entered as primary tuberculosis of muscle.

Tuberculosis of Fascia.—The ordinary form of tuberculosis observed in the fascia is the extension abscess from a bone focus. Primary tuberculosis does occasionally occur, and as such has formed an interesting chapter in the study of cystic tumors. In Progressive Medicine for December, 1905,

Cases.	Age.	Sex.	Number of Foci.	Location.	Complications with Tuberculous Foci Demonstrable Elsewhere.	Form of Lesion.		Demonstration of Bacilli.		Positive Inoculation Test.	Histological Demonstration of Tuberculosis.	Treatment.	Result.
						Node.	Abscess.	Pus.	Sections.				
(1) Habernaas.....	54	M.	12	4 on left, 3 on right forearm; 2 in right pectoral; 1 in right thigh; 1 in right leg; 1 over left malleolus.	Tuberculosis of vertebræ.	..	+	..	+	..	+	Excision.	Healing p. p. well.
(2) Mueller.....	35	M.	1	Right quadriceps femoris.	Fistula on inner side of foot.	+	+	..	..	..	+	Puncture. Iodoform. Excision.	Well.
(3) Reversin.....	17	M.	2	Right biceps. abdominal wall.	Tuberculosis of calcaneus.	..	+	..	+	+	+	Curetment.	Well after recurrence.
(4) De Quervain.....	18	M.	1	Right palmaris longus.	Vertebræ.	+	..	..	+	..	+	Excision.	Well.
(5) De Quervain.....	7	M.	1	Left sternomastoid.	Bronchial glands.	+	..	..	+	..	..	..	Death.
(6) De Quervain.....	20	F.	1	Left flex. sublim. dig.	Lung. Left tibia.	..	+	..	..	..	+	Excision.	Heal p. p. well
(7) De Quervain.....	21	F.	1	Left flex. sublim. dig.	Right humerus, metacarpal knee-joint.	+	+	..	..	+	+	Excision.	Heal p. p. well.
(8) Lejars.....	46	F.	1	Left ext. com. dig., left supinator longus, biceps.	Lung; leg; wrist	..	+	..	..	..	+	Curetment.	Death.
(9) Rosenfeld.....	14	M.	..	Left forearm.	Calcaneus, tendon sheaths of left hand; cervical glands.	+	..	..	+	..	+	Excision.	Well.
(10) Morestin.....	30	M.	2	Right pectoral.	..	+	..	..	..	+	..	Excision.	Well.
(11) Hemery.....	19	M.	..	Right quadriceps between Achilles tendon and deep flexors.	Vertebræ. Lung (suspected).	..	+	..	+	+	+	Incision.	Well. Died of vertebral tub.
(12) Hemery.....	29	M.	2	Right sartorius; left forearm.	Fibula and vertebræ.	..	+	..	..	+	..	Excision.	Well.
(13) Lejars.....	36	M.	1	Left gastrocnemius.	..	..	+	..	..	..	+	Excision.	Well.
(14) Steinbach.....	18	M.	12	Muscles of both arms and legs.	Right inguinal and cervical glands.	+	+	..	..	..	+	Excision.	Well.

Cases.	Age.	Sex.	Number of Foci.	Location.	Complications with Tuberculous Foci Demonstrable Elsewhere.	Form of Lesion.		Demonstration of Bacilli.		Positive Inoculation Test.	Histological Demonstration of Tuberculosis.	Treatment.	Result.
						Node.	Abscess.	Pus.	Sections.				
(15) Zeller	8	F.	4	Right biceps; left rectus femoris; gastrocnemius and biceps.	Cervical glands.	:	+	:	:	:	+	Excision.	Well.
(16) Zeller	24	F.	1	Right quadriceps.	Pleurisy. Glands.	:	++	:+	: :	: :	++	Excision.	Well.
(17) Lejars	50	M.	4	Right supinator longus and rectus. Left triceps and rectus.	Right elbow. Lung (suspected).	: :						Excision.	Well.
(18) Kaiser	70	F.	3	Left palmaris longus gluteus max. and gastrocnemius.	Secondary miliary tub.	:	+	:	:	+	+	: :	Death of miliary tuberculosis.

Bloodgood[6] reviewed the literature of lymph cysts of the thigh and was able to collect a few cases. In this connection the following interesting case of my own is an illustration. In March, 1903, I saw a German woman of fifty-four, complaining of a tumor of the left thigh which had been noticed a year before, and had been gradually increasing in size with no pain or temperature and but little discomfort. The woman had been complaining for some time of "rheumatism," which consisted of indefinite pains in the back and limbs. There was no family history of tuberculosis. Examination showed a very fat, apparently healthy woman. Heart, lungs, kidneys, and general condition were normal. On the anterior and inner surface of the left thigh was a large tumor extending from the groin nearly to the knee in the region of the abductor muscles. The tumor was definitely fluctuating, the skin over it was normal; there was no tenderness. The tumor did not vary in size, but was more tense with the knee flexed. There was no impairment of motion of the leg. No diagnosis was made except that of the cystic tumor, and its removal was advised. The operation was done under cocain. A long incision was made from the groin nearly to the knee on the inner surface of the thigh, and the cyst was excised by an extensive dissection. Its walls were in intimate connection with the fascia between the abduc-

tor and extensor muscles of the thigh, so that when the tumor was removed, a ragged muscle surface was left in many places, due to the removal of the fascial walls of the cyst. The cyst extended up to the saphenous opening, where it appeared to end. Its contents consisted of clear serum with white flakes and lumps of fibrin. The cyst was sent to Dr. Bloodgood for examination, and the report returned that its walls showed tuberculosis. The specimen and the original report have, unfortunately, been lost in the laboratory. The wound was closed and healed *per primam*. Four months later the patient developed a definite tuberculosis of the right ankle, with the formation of an abscess resulting in sinuses which eventually healed. There has been no evidence of tuberculous disease of the vertebræ or pelvis. Examination in July, 1908, shows the patient perfectly well, there having been no recurrence of trouble in either thigh or ankle.

In Bloodgood's report there are cited three similar cases, reported by Narath,[7] Strehl,[8] and Nordmann.[9]

Narath's case was that of a girl of twenty-two with a cystic tumor in apparently the same situation as the above, but varying in size and enlarging on straining or coughing. At operation it was found to extend beneath Poupart's ligament, and to communicate with a second cyst in the retroperitoneal region. A very extensive operation was done through three incisions, drainage being established in the lumbar region and below Poupart's ligament. The patient recovered with persistent sinuses. The contents were opaque and blood-tinged, with fibrinous flakes. The walls of the cyst are described as being fibrous, with an endothelial lining on the surface of which necrotic nodules projected. At the bases of these nodules there were giant-cells.

Strehl's case occurred after the publication of Narath's. It was quite similar, but such an extensive operation was not done. It occurred in a man of twenty who had, in the preceding year, suffered with traumatic arthritis of the right knee. The tumor appeared in Scarpa's triangle, on the same side between the adductor and extensor muscles. It was the size of the fist, with a definite pedicle extending beneath Poupart's ligament. It was compressible, and changed definitely in size in the erect or reclining position, becoming larger also when the pressure was made in the iliac fossa. There was no evidence of tuberculosis of vertebræ or pelvis. The operation, consisting of incision and the injection of iodoform and glycerin, resulted in the establishment of a permanent fistula. The patient died a few years later of what was evidently tuberculosis. Microscopical examination of the cyst-walls showed typical tuberculous granulation tissue. Its contents were yellow, serous fluid with floating flakes of fibrin.

Nordmann's case was a true lymph cyst, not tubercular, and Baer's case, reported by Bloodgood, proved to be a sarcoma. Dr. Bloodgood, in

a personal communication, states that since 1905 he has encountered three further cases. One of these represents the common history of apparently isolated tuberculosis of fascia, a cystic tumor in the thigh having resulted from the extension of a tuberculous process along the fascial planes from an involved knee. The knee was resected and cured, and at the time of this operation an extension was found into the soft parts. Some months later the patient returned with a cyst in the middle third of the surface of the thigh, which proved to be tubercular and contained serous fluid with floating flakes. This cyst had undoubtedly formed from an area of tuberculosis which had become shut off from the original point by healthy scar tissue.

Recently another case has been reported by Minssen and Weydemann, [10] occurring in an apparently healthy woman of twenty-five. There were two more or less symmetrical cysts of the thighs, each one connecting beneath Poupart's ligament with a retroperitoneal extension. There was no connection between the cysts on the right and left side, and no evidence of a bone focus of tuberculosis. These cysts likewise proved tubercular, and like the previous cases, contained clear serum with fibrinous flakes. The walls presented the appearance of tubercular granulation tissue. Minssen and Weydemann considered them gravitation abscesses.

These cysts may originate in a congenital or an acquired closure of a pouch of peritoneum present in the situation of a femoral hernia, or they may be due to the sac of a gravitation abscess from tuberculosis of bone in the pelvis or vertebræ. The bone lesion heals, the tuberculous pus disappears, and is replaced by a clear or cloudy fluid. In other cases the cyst has no relation to the tissues above Poupart's ligament, but may be due to changes in the fascia of the thigh itself. The injury of a lymphatic vessel may lead to rapid extravasation of lymph, which becomes encysted. The cysts may occur almost anywhere in the thigh, but are apparently most common anteriorly, between the abductor and the extensor muscles. They appear suddenly, grow rapidly, and cannot be differentiated from various other tumors until explored by puncture or incision. Koenig emphasized the fact that tuberculous pus from a bone focus follows the fascial planes and forms for itself a distinct tuberculous connective-tissue wall which may be easily separated from the surrounding tissue. When the tuberculous process becomes inactive, the secretion from the wall is less. The typical tuberculous contents change, becoming more and more serous, and the caseous material gradually disappears. Eventually, clear serum may result. Strehl thinks these cysts are tuberculous gravitation abscesses, in which the contents have undergone the change described by Koenig—an opinion in which Minssen and Weydemann concur. In my own case the termination of the cyst at the saphenous opening might suggest the same explanation. However, as no bone focus was ever discovered about the cyst, and as the wound healed

without the formation of a fistula, it would seem more likely than in other reported cases to have been a primary fascial tuberculosis.

These cystic tumors of the thigh represent the most interesting side of fascial tuberculosis, and present the most characteristic picture of the affection. The condition exists in other regions, especially in the neck and about joints, where it is usually plainly secondary to a tuberculous focus in gland or bone.

Tuberculosis of Tendons.—Tuberculosis of tendon-sheaths presents a much larger literature than that of either muscle or fascia, and is a much more common affection. It may be secondary to tuberculosis of bones or joints, arising by direct extension from these centers; but primary involvement of the sheaths of tendons with no other evidence of tuberculosis is by no means uncommon. The first accurate description of it appeared in 1779, by Olav Acrel,[11] who described accurately the peculiar rice-bodies from which the condition has derived its name of "ganglion crepitans Acrelid." It is also known under the name of "compound ganglion," and the rice-bodies or corpora oryzoidea, or melon-seed bodies of the English, have received a great deal of attention. Like tuberculosis of muscle and of fascia, it is a more or less sluggish affection, arising quietly with little pain and no temperature, extending gradually, and giving few symptoms and often little loss of function. It runs a chronic course, and is not likely to lead to tuberculosis in other regions. Anatomically, it presents two types: the fungous variety, analogous to the joint type of tuberculosis; and hygroma, characterized by effusion of fluid into the tendon-sheaths and by the presence of rice-bodies. Infection is through the blood-stream. It appears most often in young persons, by preference in those with a preëxisting center of tuberculosis. Trauma plays an important rôle in its history by causing a disturbance in nutrition and extravasation of blood, thus preparing a *locus minoris resistentiæ* for the reception of tubercle bacilli circulating in the blood. The influence of trauma is evident from the facts that it appears during the most active period of life, when the parts are most subject to violence, and individuals attacked are those in whose pursuits trauma is most likely, those persons engaged in heavy manual labor being more disposed. Its localization likewise is an evidence of this influence, the upper extremity being its most frequent situation, and the right hand more common than the left. The palmar tendons are more frequently involved than the extensors. It is often multiple, frequently symmetrical. A single tendon or a whole group may be the seat of the disease. It appears usually as a swelling in the region of one or more tendons, which increases gradually without involvement of the skin, in the fungous variety appearing as a diffuse homogeneous thickening, with more or less tenderness, in the hygroma presenting a fluctuating tumor in which there may be a definite crepitation, due to the presence of

rice-bodies. It bears a close resemblance to the simple or non-tubercular "ganglion," which has been shown to be an actual cystic degeneration of the tendon-sheath. Anatomically, the fungous variety is represented by a mass of edematous grayish translucent material, which more or less entirely fills the tendon-sheaths. This tissue is usually found arising from the parietal layer of the sheath, and the central tendon appears normal. On the other hand, the layer covering the tendon may be involved, and the tendon itself may be definitely invaded. This type may go on to caseation and abscess formation, with later involvement of the skin and the formation of an ulcer leading to spontaneous cure, with resulting contracture and loss of function, or it may be converted into hygroma by the extravasation of fluid and formation of rice-bodies.

In hygroma the tendon-sheaths are found distended with clear or cloudy fluid, in which float fibrinous flakes and the so-called rice-bodies. The latter may be few in number or may completely fill the distended tendon-sheaths, the fluid disappearing and the sheath being packed with the rice-bodies. The rice-bodies may eventually disappear, and the hygroma be converted into the fungous type. Actual rupture may take place, in which case secondary infection is probable. Hygroma and fungus are stages of the same process, and between them are many gradations. The wall of the sheath in hygroma varies in thickness; its surface is not smooth, but is covered with numerous excrescences. Some of these are pedunculated, hanging free in the serum. The surface of the tendon and of the sheath is glistening, and apparently covered with a layer of fibrin.

Microscopically, the sheath in fungus consists of highly vascular connective tissue with extensive cell infiltration. The tissue has an edematous appearance, and the general structure is that of tuberculous granulation tissue in other regions. In hygroma the layers of the tendon-sheath are found pushed apart by the infiltration of round-cells and leukocytes. Scattered throughout it are typical tubercles, and the tissue as a whole presents the picture of tuberculous granulation tissue. The nearer the internal surface of the sheath is approached, the more the tissue assumes a degenerative fibrinoid appearance, staining feebly, and showing few cells or nuclei. The projecting nodules show the same structure as the rice-bodies which are floating free. On the surface of the thickened tendon itself there appear to be layers of fibrin and tuberculous granulation tissue.

The rice-bodies have furnished a field for considerable investigation and controversy. In the early descriptions they were thought to be parasitic. They were then considered unorganized concretions on which fibrin had been deposited. Hyrtl, in 1842, described them as processes from the wall of the tendon-sheath. Koenig adheres to the coagulation theory, and considers them merely products of fibrin formation from the extravasated fluid.

These two theories represent the two views as to their formation. The question is not yet settled, and it is more than likely that the bodies originate in both ways. They are not pathognomic of tuberculosis, but are occasionally seen in non-tubercular inflammations of the tendon-sheaths.

Histologically, they consist of stratified, structureless, fibrinoid tissue, with few nuclei and occasional giant-cells or tubercle bacilli. Inoculation of animals with rice-bodies has given positive results in the transmission of tuberculosis. The generally accepted view is that they are analogous to the foreign bodies of joints, that they are formed as outgrowths from the tendon-sheath, which gradually become pedunculated and are finally broken off and set free. In support of this is the fact that they occur most often where there is the most motion, just as foreign bodies in joints are found to occur only in those joints where there is active motion.

The treatment of tuberculosis of muscles, tendons, and fascia is very satisfactory, and the outlook favorable. Many cases recover spontaneously, and in general they may be included under the milder forms of tuberculosis. Tuberculosis of muscle existing in the form of nodules, or as a simple cirrhotic myositis, is best treated by complete excision and suture. Where an actual cold abscess has formed, excision is the best treatment so long as the area is not too extensive. In extensive abscesses incision and evacuation, with or without injections and closure, have given good results. In tuberculosis of fascia likewise complete excision is the most satisfactory treatment, and where too extensive for this, incision and drainage may be practised. In tuberculosis of tendon-sheaths entire removal of the affected tissue usually leads to permanent cure. In all three affections, as in all varieties of surgical tuberculosis, too much stress cannot be laid upon the importance of the open-air treatment, as has been so well demonstrated by Halsted.[12] The method of Bier likewise opens up a brilliant field, and may be combined with tuberculin injections. Numerous cases are recorded in which excellent results have been obtained by the application of Bier's hyperemic method, with or without operative interference.

REFERENCES.

1. Habermaas and Mueller: Ref. by Plantard and others.
2. Kaiser: Archiv. f. klin. Chir., vol. lxxvii, 1905, p. 1033.
3. Plantard: Paris thesis, 1901.
4. Kirmisson: Bull. de l'acad. de med., 1907, No. 6.
5. Cornie: Bull. de l'acad. de med., 1907, No. 8.
6. Bloodgood: Progressive Medicine, December, 1905, p. 249.
7. Narath: Archiv. f. klin. Chir., vol. l, p. 763.
8. Strehl: Zeitschr. f. Chir., vol. li, p. 176.
9. Nordmann: Deut. Zeitschr. f. Chir., vol. lx, p. 572.
10. Minssen and Weydemann: Deut. Zeitschr. f. Chir., vol. lxxxiii, p. 577.
11. Acrel: Quoted by Garré. Beit. z. klin. Chir., vol. xvii, p. 293.
12. Halsted: Trans. Nat. Assoc. Study and Prevent. Tuberculosis, N. Y., 1906, pp. 281–303.

Tuberculose des Muscles, Tendons et Fascies.—(MITCHELL.)

Tuberculose des muscles, primaire et secondaire. Tuberculose primaire, une affection rare. Description de cas. Revue de la littérature. Types de la maladie; pathologie. Tuberculose de l'aponévrose, commune comme maladie secondaire; rare comme affection primaire. Description des cas. Discussion sur les cystes lymphatiques de la cuisse. Tuberculose des tendons,—la forme commune. Types de la maladie—le fungus et l'hygrome. Discussion sur la formation des corps oryzoïdes. Traitement. Les trois types de la maladie dans les formes plus légères de la tuberculose générale. Traitement par excision ou incision suivie d'injections. Importance du traitement dans l'air libre et de l'hyperémie de Bier.

Tuberkulosis der Muskeln, Sehnen, und Fascien.—(MITCHELL.)

Tuberkulose der Muskeln ist primär und secundär. Primäre Tuberkulose eine seltene Krankheit. Bericht von Fällen. Übersicht der Literatur. Typus der Krankheit; Pathologie. Tuberkulose der Fascien; häufig durch Übergreifung; selten als primäre Affektion. Bericht von Fällen. Erörterung der Lymphcysten am Oberschenkel. Tuberkulose der Sehnen, die häufige Form. Typen der Krankheit—Fungus und Hygrom. Diskussion der Reiskörperchen-Bildung. Behandlung. Die drei Arten der Krankheit gehören zu den milderen Formen der Tuberkulose. Behandlung durch Ausschneiden oder Einschneiden und Einspritzung.

TUBERCULOSIS OF THE STOMACH, LIVER, GALL-BLADDER, AND PANCREAS.

By Lucius W. Hotchkiss, M.D.,
Associate in Clinical Surgery, Columbia University, New York City.

Until very recent years the study of tuberculosis of the abdominal viscera has remained almost entirely within the domain of the pathologist. During the last twenty years, however, and more especially within the last decade, the surgeon's knife has brought under inspection, during life, various lesions hitherto undescribed, and has caused the symptomatology pathology, diagnosis, and treatment of abdominal tuberculosis to be placed upon the basis of observed facts and conditions.

In the case of tuberculosis of the gall-bladder and of the pancreas there is but little of surgical interest and importance, and until a symptomatology can be established which may serve as a rational basis for diagnosis in these exceedingly rare conditions, they will remain, as at present, among the pathological curiosities.

In the case of the stomach and liver, however, tuberculosis may occasionally assume a form capable of being diagnosticated, and one in which surgical measures may be more or less effective.

In a paper of this sort only the surgical bearings of gastric, hepatic, and pancreatic tuberculosis will be considered at any length, as an elaborate discussion of the pathology would far transcend the prescribed limits.

Tuberculosis of the Stomach.

This, in the vast majority of cases, is secondary to and complicated by a preëxisting lung tuberculosis, and not infrequently also is associated with intestinal tuberculosis more or less extensive.

In 1886 Joseph Coats first discovered the tubercle bacillus in a gastric ulcer. Very rarely indeed is the lesion confined to the stomach, though Litten has reported one case in which no spot of ulceration was found elsewhere in the digestive tract, and Eppinger also has made a similar observation. Lava and Orlandi further speak of the failure to find tubercular lesions in the lungs and other organs in one case, and Leven found in some of his cases only cheesy mesenteric glands as a possible focus of the disease. In

spite of these and other observations, it is believed that gastric tuberculosis is rarely primary.

Although the most frequent means of infection in gastric tuberculosis was thought by the older writers to be through tubercle bacilli taken with the food, or through tuberculous sputum which had been swallowed, it would seem, in the light of more recent investigation, that it is conveyed very often through the blood-stream (Arloing), and through the extension of infection from some neighboring tissue or organ (Chiari, Reinhold, Beneke).

The normal gastric juice, moreover, while it has no specific bactericidal qualities, furnishes a certain amount of protection against tubercle bacilli in infected foods, and the epithelium of the gastric mucosa is well protected by the mucous secretion, which tends also to diminish the virulence of the germ.

It is thought that the perigastric glands are often the primary seat of gastric tuberculosis, and that in the walls of the stomach the lymphatics of the mucosa are probably the first affected.

Under normal conditions of the stomach there is a great resistance to tubercular infection. In inflammatory conditions, however, as a result probably of alterations in the normal acidity of the gastric juice, the mucous membrane may become more vulnerable, and some of the innumerable slight abrasions or "micro traumas" which are received in the region of the pylorus may, under certain conditions, furnish an infectious atrium. It is possible also for retrograde infection from the duodenal mucosa to occur (Durante, Patella).

Years before the discovery of the tubercle bacillus in gastric ulcer, gastric tuberculosis had been recognized and described under various names, as a considerable literature attests. That it is a rare condition all the autopsy records show. Thus Eisenhardt, out of 1000 autopsies in tubercular subjects examined between 1886 and 1900 (in the Münchener Path. Inst.) found only one case of true tubercular ulcer of the stomach.

Kühl and Glaubitt, in the Kiel Institute, between 1873 and 1880, found fourteen cases. Miliary tuberculosis, much the commoner form of gastric tuberculosis, does not for the present concern the surgeon. His interest is limited to the ulcers of the gastric mucosa, and especially to the pyloric stenoses due to tuberculosis.

Tubercular ulcers of the gastric mucosa are very rare. Simmonds saw but eight cases of secondary chronic tubercular gastric ulcer in the course of 2000 autopsies in Hamburg during a period of ten years, whereas, during the same period he found the type of disease which forms a part of a general miliary tuberculosis to be relatively frequent.

Ricard and Chevrier, in fifteen years' autopsy experience in the Paris hospitals, observed only four cases of tubercular pyloric stenosis. The tuber-

cular gastric ulcer has certain features which serve to distinguish it from the simple round ulcer which is not uncommonly found in the tuberculous. It is most often solitary, but occasionally multiple. In size it is generally small and in shape round, though it may reach a large size, as in the classical case of Simmonds, where it measured 20 by 10 cm.

The site of predilection for the ulcer is the pars pylori. Thus out of twenty-one cases collected by Letorey, the pylorus was affected eight times, the greater curvature four times, the anterior and posterior wall three times, and the lesser curvature and cardia twice. Struppler found one ulcer which extended nearly around the whole pylorus, and which led to perforation and a fatal peritonitis.

The base of a tubercular gastric ulcer may be at varying depths. It may impinge upon the muscularis mucosæ, the submocosa, or the muscular coat. Its surface is yellowish in color, or a pale, grayish-red, granulating area, studded over with tubercular nodules. The microscope shows generally an infiltration of the submucous coat more or less extensive, and, at the borders of the ulcer, great infiltration of round cells mixed with giant cells and tubercular necrotic foci are evident. The blood-vessels are often the seat of an endarteritis or endophlebitis, as in syphilis, and tubercle bacilli are to be found upon the surface or within the depths of the ulcer.

Sometimes the vessels become eroded, as in simple gastric ulcer, and a fatal hemorrhage ensues. Four cases reported by Arloing met with such a fate. Sometimes the ulcer may extend to the overlying peritoneum and lead to a perforation and general peritonitis, or adhesions may form between the stomach and neighboring viscera and lead to fistulous communication with other parts of the alimentary tract. This Letorey reports one case in which the base of a tubercular gastric ulcer was formed by the adherent liver, and Mathieu and Rémond observed a fistulous communication between the diseased pylorus and the duodenum.

Hilgenreiner, out of the older literature, found two cases of fistula between the stomach and the transverse colon, viz., Abercrombie's, 1843, and Oppolzer's, 1867.

A combination of tuberculosis and carcinoma of the stomach occasionally occurs, and the theory of such a coincidence is that the carcinoma may be engrafted upon the tuberculosis, as a result of the decreased resistance furnished by the diminution of the normal gastric acidity. It must be remembered that the simple round ulcer of the stomach not infrequently occurs in the course of pulmonary phthisis, and one writer goes so far as to state his belief that most cases giving definite symptoms of gastric ulcer under these conditions are not tubercular ulcers.

A case in point recently came under my own charge, in 1906, and was operated upon by me.

Case: J. C., Italian, aged forty-one, admitted to Roosevelt Hospital, June, 1906, suffering from pulmonary tuberculosis, and for the last six months from symptoms of gastric ulcer. Nausea, epigastric pain after eating, marked hyperacidity of the stomach contents, with some epigastric tenderness were the principal features.

The case had been referred for surgical treatment for the reason that the stomach condition rendered ineffectual all efforts toward proper feeding for the betterment of his lung tuberculosis.

Operation, June 18, 1906, revealed a chronic ulcer with indurated edges, represented by a hardened, round, adherent area upon the posterior surface of the stomach, about midway between the borders and about 3 inches from the pylorus. There was no pyloric stenoses, so the ulcer was excised and the wound closed. Prompt recovery ensued and the general treatment of his lung condition was resumed successfully. The patient is at present in good health.

Besides the lesions of the stomach which are obviously tuberculous, Poncet and Leriche have recently described a third form of tubercular disease, to wit, a hypertrophic form, analogous to the hypertrophic intestinal tuberculosis, and which has its localization especially in the pylorus. In this form it is impossible to state, they say, exactly to what extent the tubercular element is causal.

Diagnosis.—The diagnosis of tubercular gastric ulcer, with or without pyloric stenosis, is always very difficult, and often quite impossible. Those cases in which the ulcer does not involve the pylorus have no absolutely distinctive features, and are practically, as far as present knowledge is concerned entirely without the domain of surgery. All cases observed in the course of operation or autopsy should be carefully studied, therefore, with reference to any points in their symptomatology which may perhaps form a basis for rational diagnosis and treatment.

Pain in the region of the stomach, anorexia, vomiting, occasionally of blood, together with the cough, the diarrhea, and the cachexia of the accompanying pulmonary lesion, make up the clinical picture. These features, however, are not sufficiently distinctive to frame even a probable diagnosis, nor does the gastric analysis help one to more definite conclusions in these cases. To be sure, hyperchlorhydria is the rule in simple ulcer, and the reverse in the tubercular type; still, in some cases the rule does not hold, and the tubercular ulcer of the stomach, in numerous reported cases, has been characterized by hypersecretion and hyperacidity, so that we are not, with the data at our disposal, able to base our conclusions upon gastric analysis.

One important feature in tubercular gastric cases is diarrhea, and this even in cases where there is no intestinal involvement. But diarrhea is so common a complaint in cases of pulmonary tuberculosis that it will probably not attract attention in most cases sufficiently to aid in making the

diagnosis. The reliability of tuberculin in fixing the diagnosis is unfortunately doubtful, and its use is not free from danger. It seems highly probable, therefore, unless the ulcer be situated at or near the pylorus, and gives rise to very definite symptoms of stenosis, that the diagnosis will not be made.

When stenosis of the pylorus occurs in a case of tuberculosis of the stomach, the symptoms are the same as in stenosis from other causes, except that perhaps diarrhea is more apt to be present in the tubercular cases, whereas constipation is the general rule. Wide dilatation may occur when the stomach is free from adhesions; and while the characteristic gastric peristaltic wave is not demonstrable in all cases, this is probably a matter of adhesions rather than a special feature of the tubercular cases. There are two varieties of tubercular pyloric stenosis—one with a rapid course, and the other with a rather slow course. The former variety is the more common. Stenosis generally develops much more rapidly in the tubercular cases than in the cases of carcinoma of the pylorus, and intercurrent disease is a much more frequent accompaniment.

Alessandri gives a résumé of the literature of cases of tubercular pyloric stenosis in which the diagnosis was made in the course of an exploratory laparotomy, and concludes that the number of cases would be somewhat greater if all cases of stenosing and non-stenosing new formations at the pylorus were submitted to careful microscopical examination. His own case was a girl, aged twenty-one, who had been sick for seven months with symptoms of pyloric stenosis, with great enlargement of the stomach, and a palpable mass, the size of a hen's egg, under the lower right ribs, which was movable. The pylorus was resected. There were no adhesions and the operation was easy. Examination of the excised portion showed stenosis of the pylorus by a tubercular mass. A good recovery ensued.

Ricard and Chevrier report four cases of pyloric tuberculosis. In reviewing the subject these writers found that primary pyloric tuberculosis with stenosis had only been observed three times in one hundred and seven cases of tuberculosis of the stomach.

Nordmann reviews one hundred and twenty-six cases of operated gastric tumors, among which only one was a case of tuberculosis. In this case a hypertrophic tuberculosis of the submucosa, blocking the pylorus, was present. It occurred in a woman thirty-seven years old, in whom a clinical diagnosis of carcinoma had been made, and a pylorectomy performed. There were no clinical evidences of tuberculosis either at the time of operation or two years later, after healing. In this case hydrochloric acid was absent and lactic acid present in the analysis of stomach contents before operation. Nordmann regards this as a case of probable infection per orem.

Jacobs reported a case in a girl of seventeen upon whom he performed a laparotomy for tubercular peritonitis with good results, but in whom one

year later symptoms of pyloric stenosis developed, for which he performed gastro-enterostomy. At the operation he found the pylorus obstructed by a ring-like mass of indurated tissue which he traced back to a proliferation from the original trouble. The case recovered.

Of thirteen cases of tubercular pyloric stenosis reported by another writer, seven were between twenty and thirty years of age and six were scattered about equally between the other periods of life. This corresponds generally to the observations of others—that tubercular disease of the stomach, whether primary or secondary, belongs to the earlier periods of life.

Certain cases of stenosis at the pylorus have been observed which were due to pressure of masses of tuberculous glands in the neighborhood, or to adhesions of peripyloric formation. Such cases have been reported by Ricard and Chevassu, Godart and Leven.

Prognosis.—The prognosis in these cases depends upon the condition of the other organs of the body. Rarely will the surgeon meet with an ideal case for resection, yet such cases have been reported.

The surgical treatment in cases of stomach tuberculosis may be palliative or radical. Under palliative measures gastro-enterostomy is the operation of choice, since pyloroplasty and gastrolysis have generally been found inapplicable or entirely wanting in efficiency. As a means of radical extirpation of the local disease, resection may be considered, *i. e.*, pylorectomy or partial gastrectomy.

To the ten cases of operation for tubercular pyloric stenosis collected by Ricard and Chevrier in 1905, Brenner adds eleven, bringing the number up to twenty-one, as follows: 14 gastro-enterostomies, 4 resections, 5 pyloroplastic, 1 gastrolysis. Of the four cases of resection, the diagnosis was absolute in three; in the fourth, Alexander's case, it is most probable. All were resected under the impression that they were cases of carcinoma.

Billroth's method No. 2 was used twice, and Kocher's once; in the fourth case the method is not stated. Two cases recovered, two died as a result of the operation. In one case of recovery (Koerte's) the patient, eighteen months after operation, was still alive, but had "apical catarrh."

Of the fourteen gastro-enterostomies, a histological diagnosis was made in seven, and in the others the gross appearances were sufficiently conclusive. Twice was the stenosis extraparietal, being caused by compression of tuberculous glands. Clinical evidences of high-grade stenosis were present.

In one case the gastro-enterostomy was secondary to a pyloroplasty which was ineffective. Seven cases were operated on by the retrocolic anastomosis and two cases by the anterior method. In five cases the method is not described.

One of the anterior gastro-enterostomies developed symptoms of "vicious circle" and called for a later entero-anastomosis. And in one case, besides

the gastro-enterostomy, an entero-plastic operation was done for an accompanying intestinal stenosis.

One case was well after three years; one case died three and one-half years after operation, of multiple tuberculosis. One case died after a year, of tubercular peritonitis; one after eight months, from the same cause; one after ten months of multiple tuberculosis. Two cases died of lung tuberculosis after one month. In two cases operative recovery is reported. In one case no details are given. In one case, after two months, a second operation was necessary. In most cases which recovered from the operation the result was the same as in inoperable carcinoma, *i. e.*, palliative, in that the starvation was relieved and the patient made more comfortable.

Both cases of pyloroplasty fared badly; the one, Ruge's case, developed symptoms which necessitated a later gastro-enterostomy. In the second case, Mayo Robson's, which did well for a week, the patient suddenly got worse and died in two weeks. The operator remarks that "with my present experience I should have performed gastro-enterostomy and begun feeding at once, and I believe the result would have been different." The case of gastrolysis of Ricard and Chevrier was not improved, and died a few months later of perforation and hemorrhage.

In summing up these results Brenner remarked: "The outlook of operative treatment in these cases is bad. The patients are tubercular, remain tubercular, and, for the most part, in a short time die tubercular. Of the twenty-one cases (one operated twice), only two are known to be alive after three years, and two which lived two years. Of the others, most of them died in the course of a year, and a good part of them shortly after operation. Perhaps," he concludes, "the statistics of fifty years, with larger numbers reported, will show a more pleasant history." He looks forward to a time when some internal specific may be found which will act as an adjuvant to the necessary surgical measures. Summing up the operative results in all his collected cases, Brenner agrees with Ricard and Chevrier that pylorectomy is dangerous and often not radical, except in the very rare case of movable pylorus with no adhesions or other involvement of the glands or other organs; that gastrolysis and pyloroplasty are absolutely ineffectual, and that gastro-enterostomy under the usual conditions found gives the best results, and is the logical, correct, and most effective measure at the command of the surgeon.

Tuberculosis of the Liver.

Tuberculosis of the liver is probably always secondary to either an intestinal or a general miliary tuberculosis. The relatively great frequency of intestinal as compared with stomach tuberculosis makes tuberculosis of the liver also of rather more frequent occurrence; and, similarly, the age at which it most frequently occurs is in childhood. Infection is generally conveyed

through the blood-stream, though the bile-ducts cannot be entirely eliminated as possible channels, in view of the experimental work of Sergent (1895). Involvement through the lymphatic current probably does not occur. The tubercle bacilli may be conveyed to the liver through the portal vein or the hepatic artery. When through the latter channel, the liver tuberculosis forms merely part of a systemic infection.

Another source, however, must be included as a possibility, *i. e.*, the toxic influence directly or indirectly exercised by the tubercle bacilli. Certain cirrhotic changes are believed to be due to this cause, and even when tubercle bacilli are not found, these cases are still to be considered as of tubercular origin.

Although tuberculosis of the liver is generally not recognized during life, there are numerous striking instances where it has led to definite symptoms. It may occur in the form of miliary tubercles upon the surface, or scattered through the organ, which may be considerably enlarged. These cases are observed in the course of a general miliary tuberculosis, form a part of a general systematic infection, and are outside the field of surgery.

The second form of liver tuberculosis is represented by the occurrence of caseating masses of various size and variable location. This is a more chronic process and includes occasional cases which are amenable to surgery. Rome reports having successfully excised such a mass.

The third form of liver tuberculosis, and the one which especially interests the surgeon, is the tubercular abscess. This may be regarded as a later phase of the caseating variety.

The first stage in the formation of these tubercular liver abscesses appears to be the formation of tubercular foci in the portal spaces. These as they increase, often by conglomeration, form variable sized and shaped masses, which, breaking down, may occasionally perforate into the bile-ducts, causing a cholangitis. These abscesses may remain well within the substance of the liver, or they may approach the surface of the liver, giving rise to a palpable tender tumor. Or they may form adhesions between the liver and the diaphragm, leading to the formation of a tubercular subphrenic abscess or a perihepatic abscess in other situations.

Perihepatic abscesses are believed to be much more common than the intrahepatic variety, and although these tubercular affections of the liver, in occasional cases, may be the only local manifestations of the disease, as a rule they constitute but a small part of the pathological condition.

Intrahepatic abscesses are, as a rule, of small size, but may exceptionally attain considerable dimensions, as in the case cited by Waring. In most cases of such tubercular liver abscess, no special symptoms are present which depend upon its existence, and it is frequently only discovered at autopsy.

The perihepatic variety, however, which is the more common, generally

begins as a localized tubercular process in some superficial portion of the liver, and extends toward the surface, where it causes a perihepatitis and the formation of inflammatory adhesions between the covering of the liver and that of some adjacent organ. These adhesions help to localize the abscess to the region of the diseased portion of the liver, and to prevent the occurrence of a general peritoneal tuberculosis.

Any part of the liver may, of course, be affected, but the convexity of the right lobe is the part which has been most commonly involved. In the rare cases where the inferior aspect of the liver is the seat of the disease, it may happen that a localized chronic abscess is found, which may exist for a long time without giving symptoms which render the diagnosis possible, and sooner or later such an abscess spreads toward the antero-inferior border of the gland, and the adjacent portion of the abdominal walls, and causes a swelling which is palpable and which exhibits the characteristics of a localized abscess. In some cases, however, the inflammatory process spreads to the peritoneum and sets up a tubercular peritonitis, which may become more or less general, and which is accompanied by symptoms which are characteristic of this disease.

Diagnosis in cases of tuberculosis of the liver in which an intrahepatic abscess is present, is practically impossible, since, as a rule, there is no considerable enlargement of the organ and there is no special train of symptoms. The subphrenic variety, however, gives rise to certain physical signs similar to those in ordinary subphrenic abscesses, such as are due to the extension of a tubercular process from the lung or pleura. When the lower surface of the liver is involved, the diagnosis is generally not possible until the inflammatory process has extended to the adjacent portion of the anterior abdominal wall, and a localized abscess has been formed.

The tubercular nature of an abscess in connection with the liver may sometimes be made out by an examination of the fluid withdrawn at an exploratory puncture. Tubercle bacilli may be found in the material so withdrawn, but this, too, is by no means the rule, since in a very old tubercular lesion it is not possible always to find the bacilli at the first examination. The contents of these abscesses are generally very thick, and it may be necessary to wash out the needle before the matter can be drawn and examined. Treatment in these cases is surgical, as in other cases of hepatic abscess. In order to promote the easy evacuation of contents in the central abscesses it is recommended to scrape the walls of the abscess with a Volkmann's spoon and pack the cavity with iodoform gauze.

As the liver abscess is generally but one part of the pathological picture, appropriate treatment of the other organs should be carried out also. When the abscess is on the inferior surface of the liver and appears as a swelling of the anterior abdominal wall beneath the situation of the lower edge of the

ribs, an incision over the most prominent part of the swelling is made, and the cavity of the abscess irrigated and drained.

Incision in the subphrenic abscess which does not present anteriorly may be made through the thoracic wall by resection of ribs or in the lumbar region following the lower border of the last rib. The location and connection of the abscess, of course, determine the method of approach.

Prognosis.—In most cases of tubercular abscess of the liver the prognosis is not good, on account of the associated lesions in other organs, especially the lungs. When, however, it is localized to the liver, and it is early diagnosticated and promptly evacuated, it is possible that the patient will remain well if other conditions can be dealt with by general measures.

Tuberculosis of the Gall-bladder.

Most of the standard works make no mention of tuberculosis in the gall-bladder. It is an exceedingly rare affection. Maylard, in his latest work on abdominal tuberculosis, makes brief reference to it, and quotes a case of Lancereaux, quoted by Rolleston, in which the common bile-duct, the cystic duct, and the gall-bladder were involved in a tubercular inflammation in a woman of thirty-two. In this case it was supposed that the infection had been derived by direct extension from the duodenum.

Holmes quotes Sergent as having encountered cases of gall-bladder tuberculosis, but in nearly all there was general systemic tuberculosis present.

Kirsch* reports a case in a woman of fifty-seven in which the wall of the gall-bladder was completely destroyed by tuberculosis. The autopsy showed the gall-bladder adherent to neighboring organs, especially the duodenum and transverse colon. The colon communicated directly with the gall-bladder through a small opening. In the gall-bladder were numerous stones and thick yellow pus. The walls of the organ were badly infected and the inner lining was covered with caseous deposits. Under the peritoneum the wall of the gall-bladder was replaced by caseous masses of a grayish substance. The process extended also to the liver and involved the cystic duct to its distal fourth. The microscope confirmed the clinical diagnosis. Tuberculosis of the gall-bladder is practically always part of a systemic infection.

Tuberculosis of the Pancreas.

The more careful examination of the pancreas at autopsy in recent years, in the course of investigations of its various diseases, has led to the discovery that it is rather more frequently involved in tubercular disease than a study of the earlier literature would lead one to believe. Still, tuberculosis of the

* "Ueber einen Fall von Cholecystitis tuberculosa chronica," Prag. med. Woch., No. 6, 1902.

pancreas is an extremely rare affection, is most frequent in children, and practically always is a secondary lesion.

The pancreas may be infected by tuberculosis through the blood, or by contiguity. While infection through the duct of Wirsung is possible, it is regarded as very improbable, for the bacilli would have to enter the organ against the natural current. In the pancreas, as in the liver, we find miliary tubercles, or caseous masses, and these masses may break down to form abscesses. In a case reported by Mayo Robson an abscess was found which burrowed behind the peritoneum and presented in the loin like a spinal abscess. Oser refers to abscesses bursting into the intestine, and Kudretsky reports a similar occurrence.

The cases of so-called tubercular abscesses of the pancreas are found often not to be cases of real pancreatic tuberculosis, but rather cases of tubercular masses in the adjacent lymph-nodes. Most cases, indeed, of large caseating masses in the region of the pancreas on closer examination have been found to be examples of lymphatic gland tuberculosis, and not tubercular pancreas. The remarkable case of Sendler was found on microscopical examination to be really a tubercular gland, the size of a walnut, from the neighborhood of head of the pancreas. It may be true, after all, that the pancreas itself is rarely the seat of tuberculosis.

Infection from the overlying peritoneum or from the kidney may take place. Here, as in the liver, a peculiar form of cirrhosis may also occur as a result of the toxic influence of the tubercular infection, and without the local existence of the tubercle bacilli. The symptoms in the few recorded cases are of no diagnostic value. The presence of a tumor, together with other facts suggestive of tuberculosis, may lend some aid in the differential diagnosis.

BIBLIOGRAPHY (Partial).

Abeille: "Un cas de t. b. pancreatique," Marseilles Med., 1906, p. 401.
Alesandri, R.: "Tuberk. de Piloro. Resection," and Bull. dell R. Acad. dí Roma, 1895.
Alexander, M.: "Beitrag zur Tuberc. des Magens," Deutsche Archiv. f. kl. Chir., 1905–06, No. 86.
Arloing, F.: "Des Ulcerations tuberc. de l'estomac."
Bandouin: "La cirrhose tuberc. chez l'enfant," Rev. Meus. des Mal. de l'infante, 1902.
Barlow, T.: "On a case of t. b. of Panc.," Trans. Path. Soc. London, 1875-76, p. 173.
Beneke: Virchow, Jahresbericht, 1851, T. iii.
Brenner: Deutsche Chirurgie, Bd. 46, C. 1907. "Tuberculose, Actinomycosis, Syphilis des Magens und Darmtract."
Brenner: "Tuberc. des Magen Darmkanals," Deutsche Chirurgie, Kiel, 1904, 46 E.
Bruen, E. T.: Specimen from a case, Phila. Co. Med. Soc., 1884-85.
Carnot, P.: "De l'sclerose, tb. du panc.," comp. Rend. ac de le, Paris, 1897.
Cassignol, B. M. P.: "Essai sur la phthisie hepatique," Paris, 1898.
Chevassu: Bull. de la Soc. Anat., 1902.
Chiari: Münch med. Woch., 1878.
Coats, Joseph: Glasgow Medical Journal, 1886 vol. xxvi, p. 53.
Durante: VI Congress, April 16, 1889; also Policlinico, vol. v, 1898. Gaz. degli Osped, May 3, 1900.
Eisenhardt: Diss. München, 1891.

Elliesen, P.: "Ueber Multipel Solitar tuberkel in der Lever," Erlangen, 1900.
Eppinger: "Ueber Tuberk. des Magens und des Oesophagus," Prag. med. Woch., 1881, Nos. 51, 52.
Fletcher, H. M.: "Tubercular Cavities in the Liver," Trans. Path. Soc. London, 1898-99, p. 7, 160 and 175.
Fletcher: Trans. Path. Soc. London, 1899, vol. l, p. 160.
Frank, L.: "Primary Tuberculosis of the Liver," American Journal Med. Sci., 1902, 630.
Gaubitt: "Ueber Magen Tuberc." Inaug. Diss., Kiel, 1901.
Ginger, S. G.: "Experimental T. b. c. of the Liver," St. Petersburg, 1902.
Godart: La Policlinique, 1901, p. 183; ibid., 1904, p. 481.
Haberer: "Ueber ein seltener Fall von Magen und Darmstenose," 1897, Review in Zentralblatt für Chir., 1905, p. 1368.
Hilgenreiner: "Die Erworbenen fisteln des Magen Darm Kanals," Deutsch. Chir., 1905.
Holmes: Annals of Surgery, vol. xliii, 1906, p. 800.
Italia, F. E.: "Panc. E. tuberculose Policlin," Rome, 1900, 1901.
Jacobs: "Stenose du pylore par localizations tuberc.," Prog. Med. Belg., 1900. Reprint, Centralblatt für Chir., 1901, No. 26.
Kühl: "Ueber Tuberc. Magen Geschweire," Inaug. Dis., Kiel, 1889.
Lancereaux: Traité de Malad. de la foie, 1899.
Lannelongue: "Tub. hépatique et peri hepat. hepatotome Cong.," 1888.
Laubry, C.: "Les hepat. tbc. Int. Medicale," 1902, p. 266.
Lava and Orlandi: Gaz. Med. dí Torino, 1893.
Lefas, E.: "Etude Anat. de l't. b. du Panc.," Arch. Gen. de Med., Paris, 1900, vol. vii, 1057.
Le Simple: "Contrib. a l'étude des Absces tbe. au foie," Paris, 1900.
Letorey: "Contribution a l'étude des ulceration tuberc. des estomac," Thèse de Paris, 1895.
Leven: "Gastrectasie due a une Compression de pylore," etc., Bull. de la Soc. Anat., Feb., 1901.
Litten: Virchow's Archiv, Bd. 67, 1876.
Loheac, J.: "Tuberc. du pancreas," Paris, 1899.
Mackenzie, H. W.: "Tubercular Dis. of the Liver," Trans. Path. Soc., London., 1889-90.
Marfan: Thèse de Paris, 1887.
Mathieu and Rémond: Thèse Letorey.
Mathieu: "Ulc. tuberc. de l'estomac," Prog. Med., 1882.
Maylard: "Abdominal Tuberculosis," 1908.
Moore, F. C.: Münch. med. Chronicle, May 19, 1899.
Nordmann: "Zur Chir. des Magen-Geschwülste," Arch. für klin. Chir., Bd. 73.
Oppolzer: Med. Presse, 1867, Nos. 50 and 51.
Pallier, E.: "Tuberc. du Pancreas," Paris, 1892.
Patella: "Delle Stenosi, piloriche nei Tuberc."
Petruschky: "Zur diag. und Therap. des primaren ulc. vent. Tuberc.," Deutsch med. Woch., 1899, vol. ix.
Poncet and Leriche: Academie de Med., May 30, 1905.
Reed: "Tuberc. Ulcerations in Stomach. The Use of Tuberculin." International Med. Mag., N. Y., 1900, vol. ix, p. 197.
Reinhold: Inaug. Diss., Kiel, 1899.
Reverseau, D.: "Contrib. a l'étude des pyo. perihepatites tuberculeuses," Paris, 1895.
Reymond: "Peritonite localisée," etc., Bull. de la Soc. Anat., 1894.
Ricard and Chevrier: "Tuberculeuse du pylore," Rev. de Chir., 1905, Nos. 5, 6, 7.
Robson, Mayo: Clin. Soc. of London, 1895, vol. xxxiii.
Rome: Annals of Surgery, 1904, vol. xxxix, p. 98.
Ruge: "Ueber primare Magentuberculose," Beitrag für klin. der Tuberc., Bd. iii, No. 3.
Sergent: Thèse de Paris, 1895.
Sholomorich, A.: "Primary t. b. of Panc.," Kurzen, Med. Jour., 1904, 373.
Sigg, E.: "Ueber Conglomerat tuberculose der leber," Zurich, 1901.
Simmonds: "Ueber Tuberc. des Magens," Münch. med. Woch, 1900, Nos. 7, 8, and 10.
Simmonds: "Ueber Tuberc. des Magens," Münch. med. Woch., March 6, 1899, No. 10.
Soboleff, L. V.: Virchow's Archiv, 1904, No. 177, supplementary volume, p. 123-8.
Struppler: "Ueber die tuberc. Magengeschwür," etc., Zeitschrift für Tuberc., Bd. i, 1900.
Suzuk, K.: "Ueber die Leber tbc. bei tbc. Andere Organes," Wurzburg, 1899.
Waring: "Diseases of Liver, etc. (Mayo Robson and Moynihan, "Dis. of Liver," etc.)

LA CURE D'ALTITUDE ET LA CURE SOLAIRE DE LA TUBERCULOSE CHIRURGICALE.

Dr. Rollier,
Leysin, Switzerland.

En 1903 nous avons installé à installé à Leysin, dans les Alpes Vaudoises Suisses, le premier établissement destiné exclusivement au traitement de la tuberculose chirurgicale par la cure d'altitude et la cure solaire.

Encouragé par les excellents résultate obtenus par la cure d'altitude de la tuberculose pulmonaire, nous avons résolu de faire bénéficier nos tuberculeux chirurgicaux des mêmes facteurs climatériques, en placant leur organisme dans les conditions idéales de défense qu'offre la haute montagne. A une technique thérapeutique conservatoire nous associons un tratement hygiénique intense, le grand air et le soleil visant ainsi avant tout à une réfection complète du terrain tuberculeux. Par un entrainement individuel et progressif nous amenons tous nos malades à vivre toute l'année à l'air libre. Dès le matin tous les lits sont roulés sur des terrasses découvertes où les malades bénéficent sans interruption de l'air vivifiant de l'Alpe.

Par le même entrainement nous les soumettons à l'action tonifiante, régénératrice et bactéricide du soleil dont l'intensité extraordinaire est un des facteurs curatifs essentiels du climat d'altitude. Des conditions climatériques exceptionnelles permettent l'insolation pendant l'hiver comme pendant l'été. Le bain de soleil à l'altitude n'incommode jamais les malades. Il est aussi essentiel comme traitement général que comme traitement local. Il produit sur l'organisme un effet tonifiant et vivifiant remarquable que l'on obtient avec aucune autre méthode. Nous avons constaté que la force de résistance d'un malade est proportionelle au degré de sa pigmentation. L'effet local et de l'insolation sur l'évolution de la tuberculose chirurgicale est encore plus remarquable que l'effet général.

L'action bactéricide de la radiation solaire est cliniquement et scientifiquement démontrée. Elle est due pour la plus grande part aux rayons infra-rouges et aux ultra-violets. Le pigment provoqué par ces derniers transforme ces mêmes rayons ultra-violets en rayons à courte longuer d'ondes et en infra-rouges. Les derniers sont directement bactéricides. Ils penètrent dans la profondeur des tissus où ils produisent également un

mouvement hyperhémique vers les parties malades, où ils activent la phagocytose. L'intensité de ces rayons est proportionelle à l'altitude.

Un des premiers symptomes de l'action locale de la cure solaire sur la tuberculose chirurgicale est son effet analgésiant. Il se manifeste d'une facon remarquable dans les cas de coxalgies, gonarthrites, péritonites, cystites, etc., où nous avons vu la douleur rebelle à tout autre traitement disparaitre ou s'attenuer après la première séance d'insolation.

Dans les cas d'arthrites telles que la coxalgie ou la gonarthrite nous associons l'insolation à une immobilisation sévère à l'aide d'appareils plâtrés que nous fenêtrons largement au siège du foyer.

La radiation solaire à une action sclérosante et nettement résolutive sur les adénites, péritonites, arthrites, etc. Sous cette action les oedèmes et les infiltrations disparaissent, les fongosités s'affaissent, et se sclérosent. Elle donne également les meilleurs résultats dans le traitement des fistules qui tarissent d'autant plus rapidement que le foyer est plus superficiel. Elle est le traitement le plus rationel de toutes les plaies. En neutralisant l'action des germes tout en sauvergardant la fonction cellulaire ce procédé réalise les conditions essentielles de traitement antiseptique idéal. L'heliothérapie à l'altitude nous parait être le traitement de choix de la tuberculose chirurgicale. Nous n'avons pas encore vu une seule forme de tuberculose osseuse, articulaire ou péritonéale qui n'ait cédé à l'insolation. Cette dernière mieux qu'aucune autre méthode permet de sauvergarder la fonction articulaire. Grâce à la réfection de terrain et à la reconstitution de l'organisme elle donne les meilleures garanties pour l'avenir du malade. Nous avons communiqué au dernier Congrès international de la Tuberculose les résultats de nos premières observations plaidant avantageusement pour ce traitement. Dès lors l'observation de plus de 180 malades est venue confirmer en tous points notre première impression. Nous n'avons pas la prétention après cinq annécs d'expériences d'apporter ici une statistique concluante nos résultats étant encore trop rapprochés. Nous citerons seulement les chiffres suivant concernant les 100 premiers cas ayant quitté notre établissement depuis plus de 2 ans:

Malades sortis	100	(dont 45 adultes).
guéris	81	(dont 30 adultes).
améliorés	12	(dont 8 adultes).
stationnaires	4	(dont 3 adultes).
morts	3	(dont 3 adultes).
Coxalgies	21	(dont 18 guéris).
Maux et Pott	17	(dont 15 guéris).
Gonarthrites	11	(dont 9 guéris).
Adénites	11	(dont 8 guéris).
Péritonites	7	(dont 5 guéris).
Tuberculose du coude	4	(dont 4 guéris).
Tuberculose du pied	3	(dont 3 guéris).
Tuberculose du poignet	3	(dont 3 guéris).

THE ACUTE FORMS OF ABDOMINAL TUBERCULOSIS.

By Daniel N. Eisendrath, A.B., M.D.,

Professor of Surgery, College of Physicians and Surgeons, Attending Surgeon to the Michael Reese and Cook County Hospital, Chicago.

There has been a general impression for many years in the minds of the profession that tuberculosis of the various abdominal structures was a disease which almost invariably began in a slow, insidious manner.

That the lesions caused by the tubercle bacillus are often accompanied by such acute symptoms as to simulate in every detail the well-recognized acute forms of disease of the various abdominal viscera is not as well known as it deserves to be.

The two structures which are most apt to be thus involved are the appendix and the peritoneum, and the present paper will be limited to these two. Mayo,[1] however, has called attention to such an acute onset in cases of tuberculosis of the Fallopian tube, and the writer, in a previous paper, has emphasized the relative frequency with which a mixed gonococcus and tuberculous infection of the epididymis will be accompanied by very acute symptoms.

My interest in the subject was reawakened by an experience during the summer of 1907. A near relative of the writer, a boy of eight, while traveling in Switzerland, was taken suddenly ill, while apparently enjoying the best of health. He began to have vague abdominal pains, accompanied by persistently high temperature (to 105° F.) of a continuous type, with symptoms of marked prostration. Upon the third day there was tenderness over the right iliac region and a distinct mass to be palpated. The diagnosis of acute appendicitis was made by the local physician and confirmed by Professor Theodore Kocher, of Berne, to whom the writer wishes to express his thanks for permission to include the case in the present paper. The abdomen was opened by Professor Kocher upon the fifth day of the illness, and a large mass exposed in the ileocecal angle, which was at first thought to be an acutely inflamed appendix wrapped in omentum. Further examination showed, however, that this mass was composed of four or five greatly enlarged ileocecal lymph-nodes, each about the size of a hazelnut. One of these nodes was excised, and showed upon section all the evidence of an acute inflammation, but contained, in addition, a number of recent caseous foci.

The remainder of the larger nodes were excised and the appendix carefully examined. It showed only acute catarrhal changes, but was removed. Microscopical examination of the lymph-nodes and appendix confirmed the diagnosis of tuberculosis. The appendix showed several typical submucous tubercles, and the nodes showed all the characteristic evidences of tuberculous infection.

The child made a slow recovery, the most marked symptoms of the convalescence being great weakness, emaciation, and anemia. During the past year the child has gained greatly in weight and strength, and seems to have made a complete recovery.

Professor Kocher expressed the opinion that the appendix had unquestionably been the atrium of infection, and that the case had been one of tuberculous appendicitis due to the ingestion of butter containing tubercle bacilli. This patient had not taken milk in any form for several years, so that infection from this source could be excluded.

After reflecting upon this case and looking over his own records and the literature of the subject for similar cases, the writer has thought it desirable to direct attention to these cases of acute onset of tuberculous appendicitis and peritonitis.

There are but few statistics available as to the frequency of primary tuberculous infection of the appendix. Fenwick and Dodwell[2] found that the appendix was the only portion of the alimentary tract involved in 17 of 2000 autopsies upon phthisical patients. Leseur,[2] in 144 examples of tuberculous appendicitis, observed at autopsies of phthisical patients, found no other lesion than that of the appendix in 12. The opinion is rapidly gaining ground that primary tuberculous infection of the alimentary tract is not as infrequent a condition as was formerly thought.

The chief sources of infection are the ingestion of milk, butter, and cheese from tuberculous cows. The danger from the meat of cattle and hogs is much less than that from milk and its products. That milk can act as a carrier of infection is so generally accepted that it will be unnecessary to dwell upon it here. It is, however, a matter of the greatest importance to be awake to the fact that butter is as potent a means of conveying tubercle bacilli from animals to man. This has recently been the subject of an investigation by the U. S. Department of Agriculture. The position of those who hold for infection by ingestion seems much fortified by the findings of E. C. Schroeder and W. E. Cotton, of the experiment station service in Washington, set forth in Circular 127,[3] entitled "Tubercle Bacilli in Butter." The authors consider that "a very large amount of butter infected with tubercle bacilli is daily consumed by our people," that this food is an ideal environment for the preservation of this bacterium. After ninety days these germs show only a doubtful reduction of pathogenic virulence. They tend to sep-

arate themselves from the milk by rising with the cream or precipitating with the sediment. Consequently, these are the parts of milk which are most intensely infected. Butter probably contains them in discernible numbers, "13 times for every 10 times they are sufficiently numerous in milk to be detected." These workers further declare that from 15 per cent. to 30 per cent. of the cows from which our cities draw their milk-supply are affected by tuberculosis; that about one-fourth of the samples of sediment taken from the cream separators of public creameries throughout the country show tubercle bacilli; and that the frequency with which these bacilli occur in the sediment from milk is a fair measure of their frequency in cream, from which butter is made. "Measure for measure, infected butter is a greater tubercular danger than infected milk." Furthermore, because of the shield offered by butter against the germicidal action of sunlight, it tends ideally for their preservation; and tests show that in ordinary salted butter of commerce the Koch bacillus "may live and retain virulence practically four and a half months or longer."

In the majority of text-books brief reference is made to the fact that tuberculosis of the appendix and peritoneum may begin acutely. The case just described and the following ones to be reported certainly show that such an acute onset is a factor to be considered in the future when we are called upon to diagnose the nature of an acute abdominal affection.

The French surgical journals have recently contained reports of some extremely instructive cases of which I will first give a synopsis.

Case of A. Demoulin.[4] Female, aged thirty-eight, had her first attack of acute pain in the right iliac region in July, 1904. A second, but more severe, attack occurred in November, 1905. She was seen by Demoulin in January, 1906, during her third attack. There was a great tenderness over McBurney's point and a hard mass to be felt. After subsidence of the acute symptoms operation on February 15, 1906, revealed a mass of lymph-nodes the size of a hen's egg in the ileocecal angle. Some of these were hard, others caseous. These nodes and the appendix were removed. The examination of the appendix was negative. The patient was well fourteen months after the operation.

The first French surgeon to call attention to the fact that a pericecal tuberculous adenitis can give rise to symptoms of acute appendicitis was Gerard-Marchant.[5] He also emphasized the fact that a tuberculous appendicitis could exist without either microscopical or macroscopical evidence of its specific nature, the only evidence being the tuberculous ileocecal lymph-nodes. This view of Gerard-Marchant has since been indorsed by other European surgeons, especially in France, and is in accordance with the experimental evidence furnished by Dobroklonsky[6] in 1890. The latter showed conclusively that tubercle bacilli can pass through the healthy in-

testinal wall without leaving any trace of their migration. This is analogous to what is frequently observed in the tonsil.

The case of Gerard-Marchant was as follows: A young Cuban had two classical attacks of what was diagnosed as acute appendicitis, with pain in the right iliac region, fever, vomiting, and tympany. The fever and a tumor in the right iliac region persisted. At operation two caseous ileocecal nodes were found, and these and the appendix were removed. The appendix showed no changes either to the naked eye or upon microscopical examination. In a case of Lecene (quoted by Petit[7]) there was a similar history and three tuberculous nodes were found in the mesoappendix. The appendix showed submucous tubercles microscopically. In all these cases the lymph-nodes may be the principal lesion, although the appendix is the atrium of infection.

Routier[8] reports a case where the appendix was large, red, and adherent, and the nodes were large and tuberculous.

In Siredey's[9] case a female of fourteen who had a tuberculous father had always enjoyed good health. She had frequent attacks of colicky pain in the right iliac region, the diagnosis of chronic appendicitis being made by Jalaguier. At operation a straw-colored fluid escaped. There were many miliary tubercles scattered over the peritoneum. The appendix was removed, but showed only the changes characteristic of a chronic appendicitis. A large lymph-node removed from the mesoappendix contained caseous foci.

Tuffier[10] has recently reported a case of Guibal and one of his own which are quite typical. In Guibal's case a previously healthy child of six began suddenly to have severe abdominal pain, accompanied by marked right-sided rigidity and tenderness, fever to 103° F., and vomiting. Appendectomy was performed four weeks later during the interval. Ileocecal nodes, the size of a large nut, showing many caseous foci, were found and removed. The peritoneum and cecum were negative. The appendix showed no tuberculous changes.

In Tuffier's own case, a girl of twelve was operated on two months after a typical attack of acute appendicitis. The appendix showed a tuberculous folliculitis and there were several caseous ileocecal nodes which were also removed.

A case similar to those just quoted occurred during the past summer in the Michael Reese Hospital service of my colleague, Dr. Louis A. Greensfelder, to whom I am indebted for permission to publish it here.

L. T., girl aged five, was admitted to the service of Dr. Greensfelder June 2, 1908. Parents both living and in good health. Patient is the only child; well nourished, taken ill suddenly the day preceding her admission with pains in abdomen and left side of chest. Had been apparently in best of health prior to onset of present illness. Examination upon admission showed a small area of consolidation in upper lobe of left lung.

The abdomen was somewhat tympanitic, quite rigid, and there was general tenderness on pressure, but this was marked in the right iliac region. Upon opening the abdomen a free straw-colored fluid escaped. The glands in the meso-appendix were greatly enlarged and caseous. The appendix was injected and thickened. Appendectomy and removal of glands. No microscopical examination of the appendix was made. Recovery from operation and discharge from hospital on July 19, 1908.

The following cases of acute tuberculous peritonitis occurred in the service of the writer.

Case 1.—Encapsulated (subphrenic) tuberculous peritonitis with very acute onset simulating ordinary subphrenic abscess.

V. de S., male, forty-eight years of age, was admitted on August 24, 1906, to the medical service of Dr. J. L. Miller, in the Cook County Hospital, with the diagnosis of pneumonia. On account of the patient's inability to speak English well, the only history obtainable was that he had been perfectly well up to nine days before admission, when he began to have pain in the abdomen which varied greatly in intensity and was most marked around the umbilicus. The leukocyte count was 8600, the abdomen distended, and the temperature ranged between 100° F. and 104° F. The condition remained unchanged for ten days. Owing to the fact that the rigidity and tenderness were most marked in the right hypochondrium, a diagnosis of acute cholecystitis was made, and he was transferred to the surgical service of Dr. Charles Heywood. The latter opened the abdomen, and the appendix and gall-bladder were found normal. There were, however, many dense adhesions between the coils of intestine, and the omentum was adherent to the abdominal wall. After this operation the temperature rose still higher (to 104-4° F.), and there was accompanying stupor, delirium, and rapid respirations (to 44).

In the absence of Dr. Heywood the patient was seen by the writer on September 6, 1906. There was a marked stupor, there was dullness extending upward from the liver to the fourth rib in the mammary line, to the fifth rib in the midaxillary line, and seventh rib in the scapular line. There was an absence of respiratory sounds over this area. Upon inserting an exploring needle through the eighth interspace a foul flaky fluid was obtained. The eighth rib was resected in the scapular line, and the pleural cavity found empty. The diaphragm was sutured to the parietal wound, and about twelve ounces of a slightly turbid fluid evacuated from the subphrenic space. The patient made a slow recovery, the subphrenic wound continuing to discharge for several weeks. About eight weeks later evidence of marked ascites appeared, and patient died about six months later. The autopsy showed a typical tuberculous peritonitis with effusion. The subphrenic region showed firm adhesions over the previously involved area.

Case 2.—A. L. W., aged twenty-six years, clerk. Had always enjoyed good health. Family history negative. Present illness began suddenly in February, 1904, with pain in right iliac region, but no fever. A physician who saw him at the time made a diagnosis of appendicitis. When first seen by the writer in June, 1904, there were evidences of an encapsulated collection of fluid in the right iliac region. Laparotomy revealed a walled-off

collection of thin yellowish pus occupying the right half of the abdomen. The posterior wall of this abscess cavity was formed by agglutinated coils of intestines covered with tubercles and granulation tissue which showed evidences of tuberculosis microscopically. Complete recovery.

Case 3.—Acute onset of tubercular peritonitis with high continuous fever resembling typhoid. A female, aged thirty-five, had been ill five weeks when first seen by the writer. The illness had begun suddenly with mild abdominal pains and other vague symptoms like a typhoid. Her fever had been of the continuous type, and ranged between 101° and 104° F. She had been given the routine typhoid treatment. Examination by the writer showed evidences of fluid, and laparotomy revealed a very advanced ulcerative caseous peritonitis. An example of such an acute onset is shown in the recent report of a case by A. K: Stone.[11]

Case 4.—Female, aged twenty-two years, mother died of phthisis, was admitted to the Massachusetts General Hospital in February, 1907. Her illness had begun suddenly three days before admission, with severe abdominal pain and vomiting. Upon admission the abdomen was found to contain free fluid, accompanied by rigidity and tenderness. The evidences of fluid disappeared under medical treatment. Stone states that sudden onset is common in tuberculous peritonitis, being found in about one-quarter of all cases. The fluid both accumulates and disappears rapidly.

Osler refers briefly to the fact that tuberculous peritonitis may begin suddenly and be accompanied by continuous fever, resembling that of typhoid fever. The absence of the Widal reaction, the leukopenia, and not infrequently the evidences of the presence of free fluid will serve to distinguish the process as a tuberculous one.

A case is reported by Michaux,[12] resembling my own, of an acute onset of tuberculous peritonitis with symptoms pointing to a subphrenic abscess. In Michaux's case the onset was very sudden, with great dyspnea resembling a pneumothorax clinically. There was high temperature, and edema over the right side of the abdomen and chest-wall. An incision along the costal arch evacuated pus containing gas. There was temporary improvement, as in the writer's case, but death occurred one month later. The autopsy showed a dry tuberculous peritonitis.

The most complete statistics upon tuberculous appendicitis are those of Brunner,[2] based upon 51 cases collected from the literature. It includes all published cases in which appendectomy had been performed. To this number I can now add 7. Of these 59 cases nearly one-fourth, *i. e.*, 16, had symptoms which in every detail resembled an attack of acute appendicitis. The direct operative mortality in this series of 59 cases has been very small. It is almost impossible to state what the final results have been, because so few of the cases have been followed for a sufficient time to speak of a complete recovery, and in many of the reports the patients suffered from tuberculous lesions elsewhere which ultimately resulted fatally.

If, however, in such cases as those of the French surgeons just quoted and of Kocher's and Greensfelder's, the lesion is operated upon early enough, and the appendix and glands removed, the prognosis should be very favorable. That the appendix in many of the cases showed no tuberculous changes does not militate against such a specific infection. As stated above, the tubercle bacilli can pass through the walls of the appendix without leaving any trace of their passage. The bacilli can then infect the ileocecal lymph-nodes, or be the starting-point of a tuberculous peritonitis.

My conclusions are the following:

1. That a primary tuberculous appendicitis is not as rare an affection as was formerly thought.

2. That such an infection can be followed by secondary involvement of the ileocecal lymph-nodes which is out of all proportion to the pathological changes in the appendix.

3. In the majority of cases there are evidences of tuberculous foci in the appendix, but secondary caseous lymph-nodes may be found without visible macroscopical or microscopical tuberculous changes in the appendix.

4. Butter, milk, and cheese from tuberculous cows are the chief sources of infection in primary intestinal tuberculosis.

5. In a fair proportion of the 59 published cases (27 per cent.) of tuberculous appendicitis the clinical picture resembled that of an acute non-tuberculous appendicitis. No statistics are available to estimate the proportion of cases of tuberculous peritonitis which begin acutely, but the number is larger than it is usually thought to be.

6. Through early diagnosis and radical removal of the tuberculous appendix and infected lymph-nodes (as far as practicable) complete and permanent recovery can occur. Some of the cases of ileocecal tuberculosis and of tuberculous peritonitis may thus be avoided through removal of the probable starting-point.

BIBLIOGRAPHY.

1. Mayo: Jour. Amer. Med. Assoc., April 15, 1905.
2. Brunner: "Deutsche Chirurgie," vol. xlvi, e.
3. Schroeder and Cotton: Report 127 of the Bureau of Animal Industry, Department of Agriculture.
4. Demoulin: Bull. et Mem. de Soc. de Chirurgie de Paris, May 15, 1907.
5. Gerard-Marchant: Same as above, January 24, 1900.
6. Dobroklonsky: Archives de Méd. expér. et d'anat. Path., No. 2, 1890.
7. Petit: Dissertation de Paris, 1905.
8. Routier: Bull. et mem. de Soc. de Chirurgie, July 5, 1905.
9. Siredey: Same as above, May 15, 1907.
10. Tuffier: Same as above, May 29, 1908.
11. Stone: Boston Med. and Surg. Jour., May 16, 1908.
12. Michaux; Bull. et Mem. de Soc. de Chirurgie, 1897

DISCUSSION.

Dr. Gregory Connell (Oshkosh, Wisconsin) said the term acute tubercular appendicitis was misleading, as it was evident from the history of the cases that the condition was that of a tubercular appendicitis upon which there had been ingrafted an acute process which caused the symptoms which led to the diagnosis. A tubercular process was essentially chronic, rarely acute, and the fact that caseous degeneration had taken place in the glands of the mesentery would lead one to believe that such was the case. Out of 300 cases of appendicitis examined during the past year he had found only one that was tuberculosis.

Dr. H. G. Nierman (Fort Wayne, Indiana) said it had been demonstrated that food taken into the stomach passed through the intestinal tract more rapidly in the beginning, and its movement become slower and slower the farther down it went. The intestinal flora increase in proportion as the movement of the food becomes slower. Stagnation tends to produce disease. The condition of the appendix particularly favored the growth of bacteria. In the treatment of certain of the cases mentioned he suggested that it might be well to perform anastomosis between the ileum and the descending colon, thus cutting out the diseased portion.

Dr. Beck said he would like to ask Dr. Bevan whether he removed part of the ureter in performing nephrectomy when it was found to be tuberculous.

Dr. Bevan, in closing, said he thought the rule should be to dissect the ureter out as widely as possible without adding too much to the risk of the operation. He had no sympathy, however, with Kelly's proposition to remove the entire ureter and then turn the stump into the bladder. He said he thought the most important work in connection with kidney tuberculosis should be done by the internists. Those who do not believe in the surgical treatment should compare the results of general hygienic treatment, the tuberculin treatment, and the surgical treatment, as there were no statistics available comparing these different methods.

Dr. Eisendrath, in closing, said the point brought out by Dr. Connell was not a debatable one. We had acute tuberculous pneumonia, and why not an acute tuberculous appendicitis?

Fig. 1.

Fig. 2.—Atrophy of gluteal muscles, and compression atrophy of the recto-spinal muscles.

Fig. 3.—Showing atrophy of the gluteal muscles.

RATIONAL SPINAL SUPPORT.

By Henry W. Frauenthal, A. C., M.D.,
Physician and Surgeon-in-Chief of the Hospital for Deformities and Joint Diseases, New York.

The orthopedist has been slow in assimilating into the treatment of tuberculous bone lesions the many valuable truths of recent scientific development in use in tubercular processes of the soft tissues. This paper is to call attention to defects in conventional mechanical treatment now in use.

I hope to be able to demonstrate, by means of photographs of apparatus on patients that are herewith presented, that fundamental principles of applied mechanics have not been made use of in the application of the braces now generally in use in tuberculous disease of the spine, and that the bad results made manifest in hideous deformities have resulted from a failure to apply such scientific principles of mechanics in the fitting of braces, as would be applied in other mechanical endeavor (Cases 1, 2, and 3), all these cases being under treatment from the time that disease occurred, but before a knuckle was evident, until the deformity developed.

It appears to me that we have an imperialism of brace application without fully determining if the apparatus would properly do its work and render such fixation and support to the spine as the nature of the disease requires.

In many cases we see braces and jackets (plaster, leather, felt, celluloid, etc.) applied to prevent increasing deformity, without regard to its mechanical function in the given case. This is frequently seen when the disease is above the seventh dorsal vertebra, when the brace or jacket is applied without the addition of a jury-mast.

In the mechanical treatment of tuberculous joints we must decide which is best—

1. Fixation.

2. Fixation with traction, thus trying to separate the inflamed surfaces and prevent the absorption produced by muscular and ligamentous contraction.

3. Traction with motion.

If we wish to obtain fixation, our support must be such as to permit of the least possible amount of motion.

If traction is to be added, which is always to be desired in disease of the

body of the vertebræ, to prevent absorption by pressure, our support must come from the ground, through the bony framework of the pelvis and extremities. This can be accomplished only by the brace firmly resting on the bony framework of the pelvis, when extension can be made by the brace itself or by a jury-mast. The former is simply accomplished by throwing the weight on the transverse processes of the vertebræ. This cannot be done by the Taylor brace, Knight's crib, or similarly constructed apparatus, as they attempt to rest the base (x-y) for support on the gluteal muscles and hold it fixed by means of an apron. This result is a pressure atrophy of the gluteal muscle.

As this type of brace has been in vogue for such a long time, I will now point out its mechanical and physiological defects, with some of the common results shown in patients treated by this method.

The two parallel metal bars (S, V, S′, V′) that extend down both sides of the spine are attached to a circular band, X-Y, that rests on the gluteal muscles; the other construction of the brace does not enter into the mechanical principles under discussion.

Resting the lower band of the brace (X-Y) on a child's soft gluteal muscles must result in the brace sliding down on these soft tissues and merely adding the additional weight of the brace to the superimposed weight above the point of disease, to exaggerate the disease by increasing weight and pressure.

To prevent this slipping, the second error in treatment and mechanism has been made, by tightening an apron about the chest and abdomen, with the result that it is about soft relaxing tissue that cannot be fixed in this way, only constricting the abdominal muscles below, interfering with digestion, often producing a pressure constipation above, the apron about the chest interfering with respiration and producing imperfect and defective metabolic processes in the whole economy. The pressure produced by the lower bar about the gluteal muscles (results in photos, cases 1, 2, 3) produces atrophy of these muscles. Thus the restriction of the apron interferes with the development of the child and his ability to build up a resistance, to throw off the tuberculous disease, and secondly, the additional weight increases deformity.

By this I mean that in cases seen by me, in which nature's cure has resulted without the aid of any surgical treatment, the bony prominence has given less deformity than the hideous deformed backs that are shown in these pictures (1, 2, 3), and many other photographs in my possession, where, by the lowering of the vitality, by the restriction of the apron, and the added weight of the brace, these unsightly deformities have resulted.

I wish now to draw your attention to a brace, carrying a collar over the crest of the ilium (Fig. 5), giving a primary bony support, through the pelvis and leg, to the ground. This support does away with the necessity

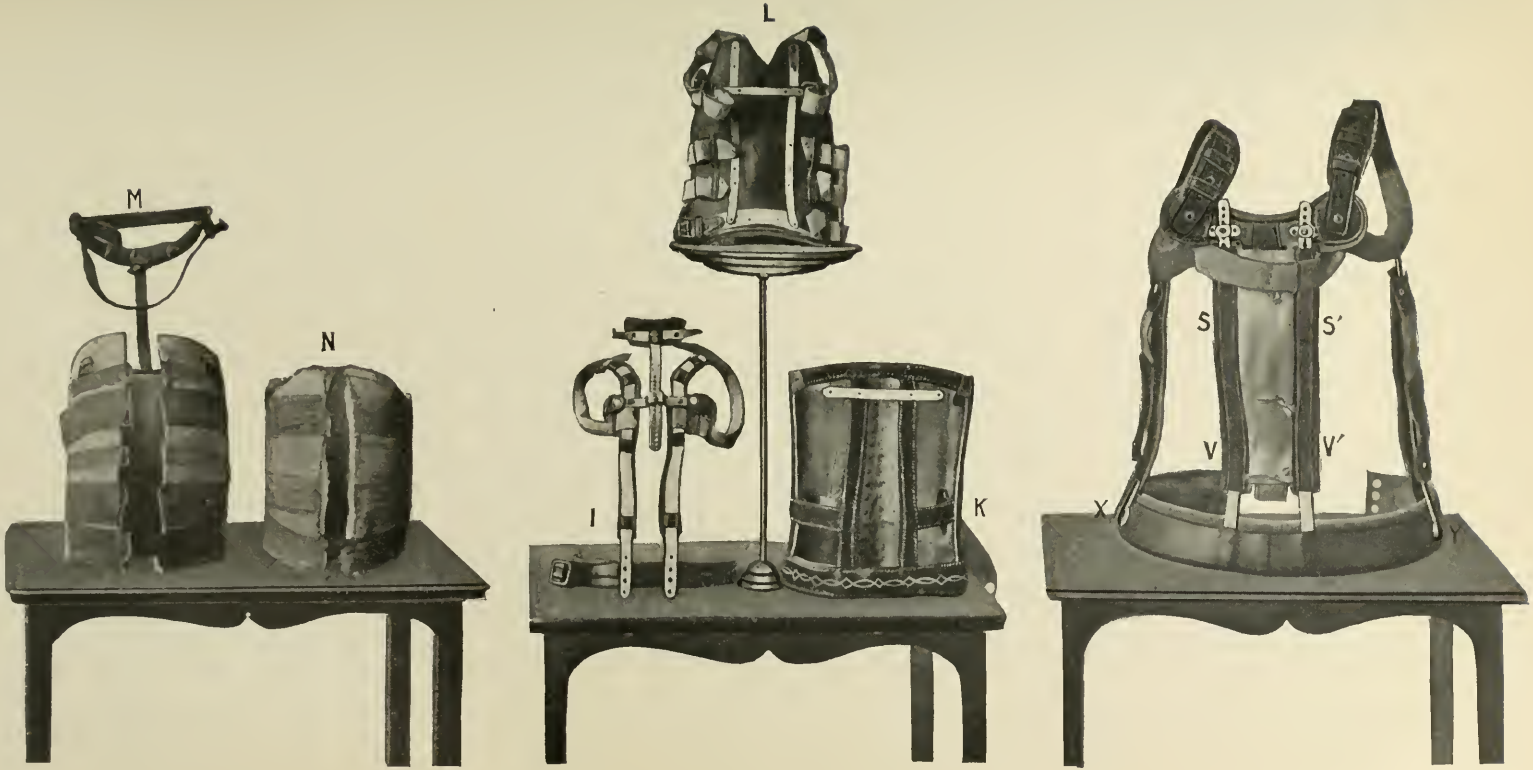


Fig. 4.

of an apron, and permits us to throw the superimposed weight back on the transverse processes. By dispensing with the apron, the lungs and heart can be developed, and the digestive function is unrestricted, a high vitality is kept up and resistance furnished to incapsulate the tuberculous process.

As one sees so frequently tuberculous disease of the spine above the seventh dorsal vertebra, it must rest with the surgeon whether rest on a cuirass or ambulatory treatment, with a brace or jacket, be used, but in the latter case it is imperative to attach a jury-mast, as the jacket alone interferes with the child's general health and accomplishes nothing toward a cure.

The following case represents one of the type seen at the Hospital for Deformities and Joint Diseases so frequently as to call for some comment.

A. Mc., referred by Dr. DeKraft, with the following history: In February, 1907, the child complained of stomach and abdominal pains, and on advice of another tenant in the house, who had a child suffering with Pott's disease, she went to an orthopedic dispensary, March 2, 1907, where a diagnosis of disease of the dorsal spine was made, but the child was sent home to await its recovery from whooping-cough.

She returned May 24, 1907, for the first jacket, and by May 18, 1908, she had had four jackets applied; in the mean time she was kept in the Masonic Home in Utica. Her condition growing worse, she was referred back to Dr. DeKraft, who had been the means of admitting her to the home. He referred her to me at the Hospital for Deformities and Joint Diseases.

On presenting herself for examination she wore a plaster jacket without a jury-mast. Fig. 6 shows location of knuckle, which we see in so many similar cases. The disease is above the jacket support, hence it is of no mechanical protection. The child was placed on a cuirass, and in five weeks gained seven pounds. The photograph was taken after improvement.

This brings up the very important question of jackets and braces or cuirass in treating children. The case is now in a form of cuirass, devised by the author, made of gas-piping, with a bar across the center (Z), dropped two inches, from which a metal fork (a–b—a–b) covered with rubber comes up, upon which the child rests (Fig. 7). A fork arrangement (c–d—c–d) can be raised and lowered anteriorly and posteriorly, and by e–f can be pressed in over the crest of the ilium, to keep the pelvis fixed, so that the jury-mast (h–i—h–i) can make countertraction.

Since being placed on this cuirass the patient's pain has disappeared. She has gained eight pounds, and is quite content in the recumbent position.

To illustrate the advantage of the recumbent position, I will briefly record.

Case 2, M. L., was sent here from Tonawanda, Pa., in March, 1903, to consult me. Having no hospital association to send charity patients to at that time, I referred him to Mt. Sinai Hospital, where he remained two weeks under observation, and a diagnosis of lower dorsal Pott's was made by Dr. H. Koplik, who referred the case to the Ruptured and Crippled Hospital, March 18th, where the child remained one week for observation. The

diagnosis of Pott's disease was confirmed, but treatment was refused, as the patient came from another State. The case then returned to me. We placed him on a cuirass, had him return home and kept in the open air, giving light massage to his disused limbs, nutritious diet, and had him return every four months. He remained on the cuirass nineteen months, then wore plaster jackets for two years. Fig. 8 shows him in the present condition cured, being without a jacket for over a year.

Case 5 represents an effort to obtain fixation in the third, fourth, and fifth dorsal vertebræ, by means of a jacket and combination of metal and webbing head-band.

This is impracticable in order to hold the head fixed, for the band would be so tight as to be painful, and when traction is not added, in disease of the upper dorsal vertebræ, there is no remission of the pain in the intercostal nerves in this location.

The patient was under the care of a competent orthopedic specialist for fourteen months, wearing the apparatus shown in Fig. 4, but as the pain continued, and the angle of deformity appeared to increase, she was referred to me.

When a jacket and jury-mast (Fig. 9) was applied, the pain disappeared. The knuckle is scarcely perceptible, and the child is cured without deformity, showing a decrease equivalent to one-half inch in the knuckle of the spine.

In place of a jacket and jury-mast we may use a leather or celluloid collar in disease of the cervical vertebra (Fig. 10).

I also wish to call your attention to the most common error in the application of plaster jackets. When we fail to mold the jacket over the crest of the ilium, but leave the jacket's side straight to the crease over the crest of the ilium, we fail to secure support, and the jacket slides up and down, excoriating the bony prominence, requiring frequent removal of the jacket, and giving inadequate support.

In conclusion I wish to state that unless a brace rests upon the bony pelvis by a collar across the crest of the ilium, or some similar support, it is inefficient and harmful, for when resting on the soft tissue, it slides down and adds the additional weight of the brace to the superimposed weight of the body above the point of disease. The damage done to the vital functions by the girding constriction of the apron is decidedly detrimental to vital strength and resistence.

There is another serious ill effect of tightening the apron on; that is, by the compress produced by the bar S, V, Sv SV. We also have a compression atrophy of the erector spinæ muscles, thus destroying nature's best fixation splint.

When disease occurs above the seventh dorsal vertebra, either the patient should be treated in the recumbent position for months or years, or a brace or jacket applied with a jury-mast attached that will take off the superimposed weight above the point of disease.

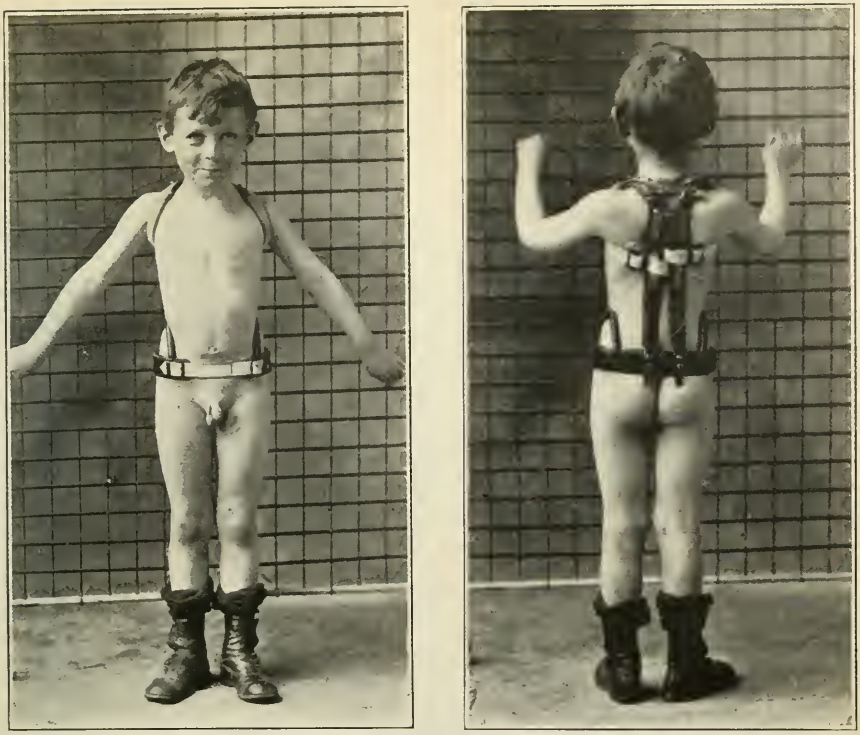


Fig. 5.—Author's brace with collar over crest of ilium.

Fig. 6.

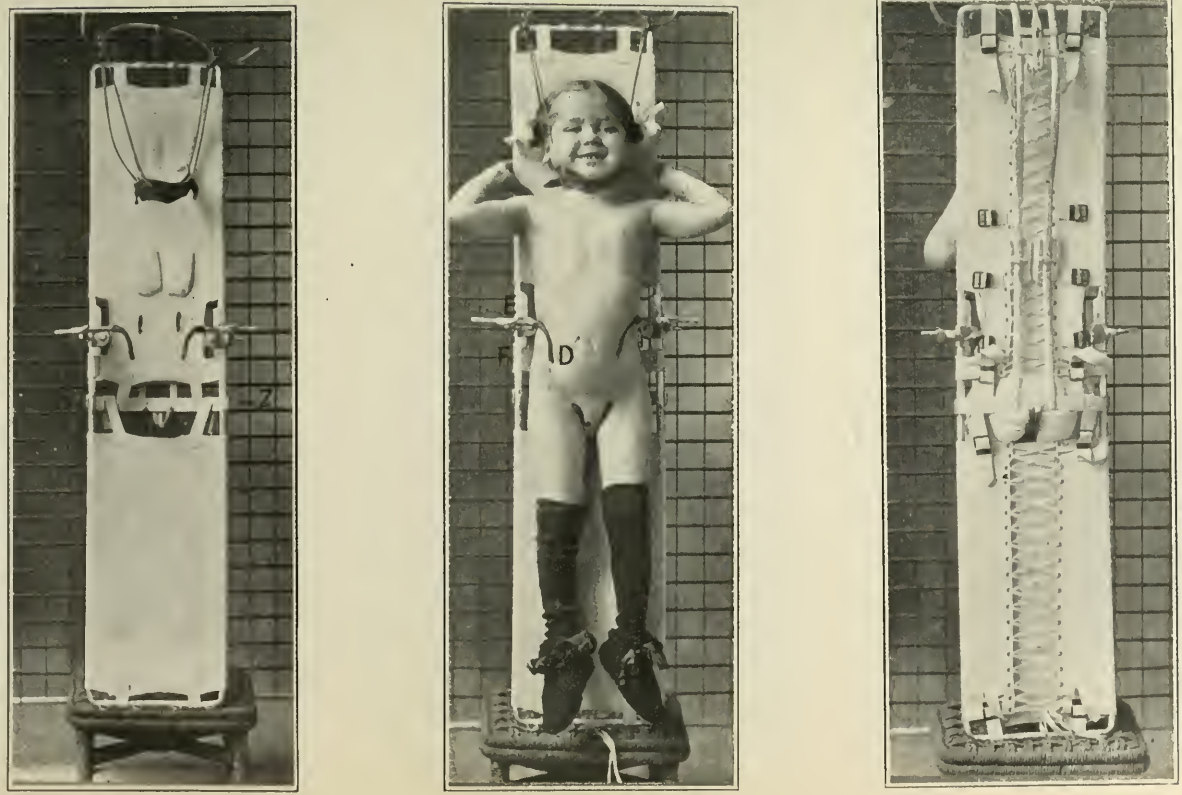


Fig. 7.—Author's cuirass.

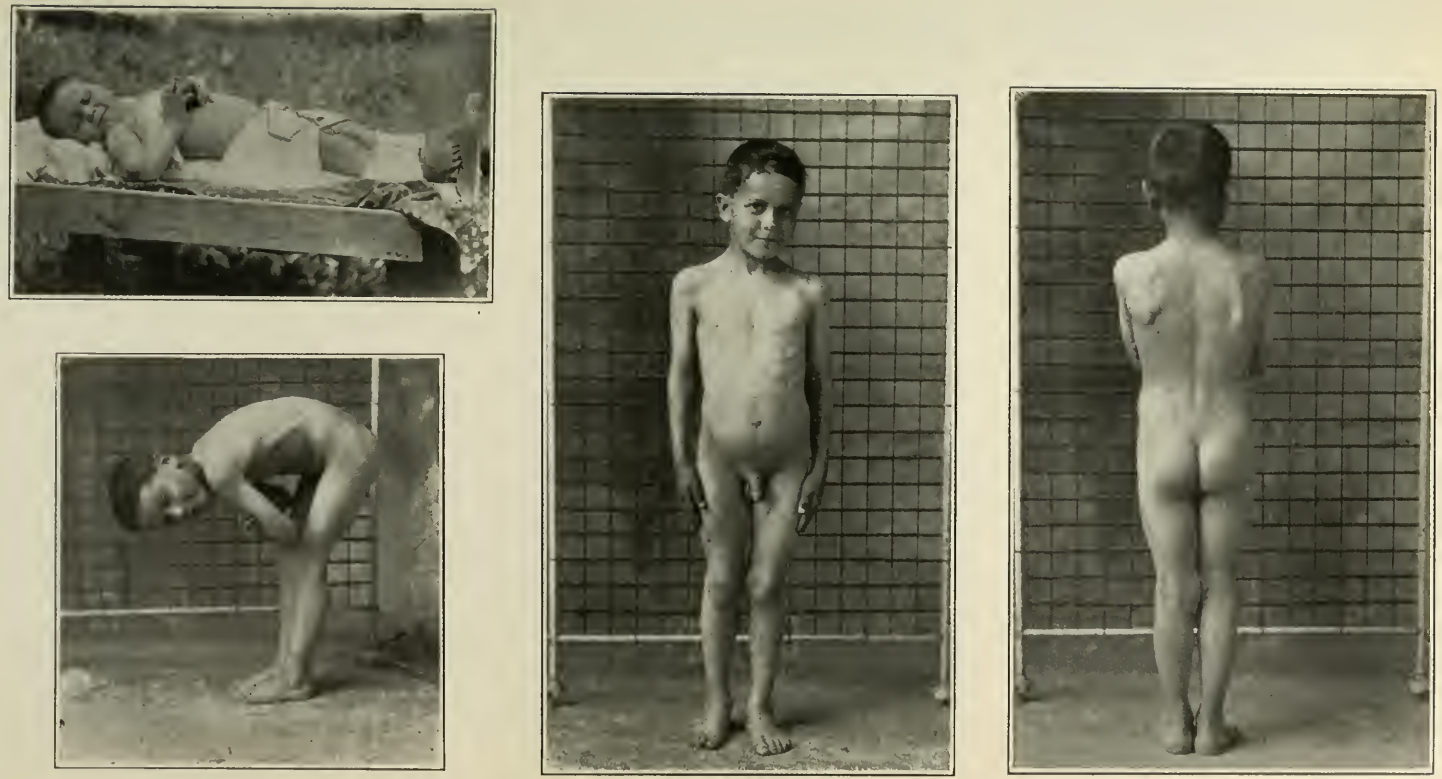


Fig. 8.—Open-air treatment with cuirass. Cure with perfect function.

Fig. 9.—Plaster cast with jury-mast and shoulder brace.

Fig. 10.—Support for cervical parts, without constriction of thorax or abdomen.

ÜBER DIE NIERENTUBERKULOSE.

Von Dr. G. von Illyes,
Budapest.

45 Fälle von Nierentuberkulose, von welchen 36 operirt (Nephrectomie) wurden. Mortalität, 5.56 Prozent.

Zusammenfassung.

1. Die Nierentuberkulose kommt ebenso häufig bei Männern wie bei Frauen vor.

2. Die linkseitige Nierentuberkulose ist ebenso häufig wie die rechtseitige.

3. Die Nierentuberkulose entsteht in der grössten Anzahl der Fälle auf dem Wege der hämatogenen Infektion unter gewissen Verhältnissen, jedoch kann auch eine ascendierende Infektion beobachtet werden.

4. Die häufigste Form der Nierentuberkulose ist diejenige, bei welcher sich Kavernen in der Niere bilden.

5. Die spontanen Heilungen sind nur scheinbare und nicht dauernde.

6. Eine genaue Diagnose im Anfangsstadium kann man nur nach gleichseitiger Kathetherisation beider Ureteren machen.

7. Die Harnscheiden sind nicht verlässlich.

8. Die verlässlichsten diagnostischen Momente erhält man durch Bestimmung des Gefrierpunktes des Urins und der Verdünnungsfähigkeit der Nieren.

9. Nach Feststellung der Diagnose ist möglichst frühzeitig die Nephrectomie auszuführen, bevor noch eine descendierende Blasenerkrankung entsteht.

10. Die im Urin der andern Niere auffindbaren Eiweiss- und Nierenbestandtheile kontreindiciren bei guter Nierenfunction nicht die Entfernung der kranken Niere.

11. Vorhergehende Erkrankungen der Blase beschleunigen das Enstehen eines diffusen, tuberkulösen Blasenkatharrs.

12. Eine umschriebene tuberkulöse Erkrankung der Blase kann nach Entfernung der kranken Niere spontan heilen.

Tuberculosis of the Kidneys.—(von Illyes.)

The writer studied 45 cases of renal tuberculosis, 36 of which came to operation—nephrectomy; mortality, 5.56 per cent. From this material it can be seen that:

1. Renal tuberculosis is as frequent among men as among women.

2. Renal tuberculosis is just as frequent on the left as on the right side.

3. In most cases renal tuberculosis is due to hematogenous infection; under certain conditions an ascending infection may also be observed.

4. The more frequent form of tuberculosis is that in which cavities are formed in the lungs.

5. Spontaneous recovery is only apparent and never permanent.

6. In the initial stage an accurate diagnosis can be made only by simultaneous catheterization of both ureters.

7. Urine separators are untrustworthy.

8. The most trustworthy diagnostic points are obtained by determining the freezing point of the urine and the power of the kidneys to dilute the urine.

9. After the diagnosis has been made, nephrectomy should be performed, early, before a descending cystitis develops.

10. The presence of albumin and renal constituents in the urine of the other kidney is not a contra-indication to removal of the diseased kidney if the function is good.

11. Previously existing disease of the bladder hastens the development of diffuse tuberculous cystitis.

12. Circumscribed tuberculous inflammation of the bladder may heal spontaneously after removal of the diseased kidney.

Tuberculose des Rognons.—(VÖN ILLYES.)

L'auteur a étudié 45 cas de tuberculose rénale, 36 desquels furent opérés (néphrectomie); la mortalité a été de 5.56 pour cent. Il découle des indications précédentes que.

1. La tuberculose rénale est aussi fréquente chez les hommes que chez les femmes.

2. La tuberculose rénale se produit aussi souvent au côté gauche qu'au côté droit.

3. Dans la plupart des cas la tuberculose rénale est due à une infection hématogène, et que sous certaines conditions une infection ascendante s'observe aussi.

4. La forme la plus fréquente de la tuberculose rénale est celle où des cavités se forment dans les reins.

5. La guérison spontanée est seulement provisoire et n'est jamais permanente.

6. Au début de la maladie un diagnose exact ne peut être fait que par la cathéterisation simultanée des deux uretères.

7. Les séparateurs d'urine ne sont pas sûrs.

8. Les renseignements les plus certains pour un diagnose sont obtenus en déterminant le point de congélation de l'urine et la capacité des reins pour diluer l'urine.

9. Après que le diagnose a été fait néphrectomie immédiate, avant qu'une cystite descendante ne se développe.

10. La présence d'albumine et d'éléments rénaux dans l'urine de l'autre rein n'est pas un indication contraire à l'enlèvement du rein malade.

11. Une inflammation tuberculaire circonscrite de la vessie peut guérir spontanément après l'enlèvement du rein malade.

ÜBER NIERENTUBERKULOSE.

Von Dr. Béla von Rihmer,
Budapest.

Seitdem es allgemein bestätigt wurde, dass die Nierentuberkulose in der Regel von hämatogenem Ursprunge ist, die Krankheit in der überwiegenden Anzahl der Fälle zuerst einseitig auftritt, endlich, dass die Blase nur später von der Niere her infiziert wird, wurden die Operationsindikationen um vieles erweitert. Heute heisst es im allgemeinen, je früher zu operieren, um damit die Entwicklung oder die Ausbreitung der Blasentuberkulose zu verhindern.

Verfasser studierte auf Grund von etwa 70 Fällen die Symptomatologie und Frühdiagnostik der beginnenden Nierentuberkulose. Im frühesten Stadium der Krankheitssymptome (es gibt eben eine latente Periode ohne Symptome) sind diese oft gering und mögen sie auch den Verdacht auf urogenitale Tuberkulose lenken, ist die sichere Diagnose nur aufzustellen, wenn das spezifische Bakterium im Harne nachweisbar ist.

Zusammenfassend kann man als Gesetz betrachten, dass bei jeder rätselhaft beginnenden Cystitis (ohne Gonorrhoë oder Katheterinfektion) aber auch bei gonorrhöischen Cystitiden welche einer rationellen Therapie dauernd trotzen, endlich bei jeder andauernd bestehenden Pyurie an die Möglichkeit einer Nierentuberkulose zu denken ist. Bei jeder Hämaturie, welche nicht durch Neoplasma, Nephritiden bedingt wird, weiterhin bei jeder Nierenkolik, deren Ursache nicht in einem Abflusshindernis besteht, sollte man die Möglichkeit der Tuberkulose vor Augen halten.

Verfasser ist der Ansicht, dass die Fälle, ausgenommen in welchen Hämaturie oder Koliken bestehen, daher zuerst auf Neoplasma oder Stein untersucht werden sollen, in der Regel erst nach dem spezifischen Bakterium gesucht werde. Es ist eben die Aufgabe der Bakteriologie, die Aetiologie klarzustellen, dann erst sollen weitere Untersuchungen (Cystoskopie, Ureterenkatheterismus), die Lokalisation des Uebels zu machen, unternommen werden.

Betreffs des Nachweises des spezifischen Bakteriums hat Verfasser im pathologisch-anatomischen Institute des Herrn Hofrates Prof. Pertik in mehreren Richtungen Versuche gemacht.

Bekanntlich geschieht der Nachweis der Bazillen durch Färbung oder

Auszüchtung, endlich durch Tierexperimente. Auf Nährböden misslingt die Auszüchtung wegen Mischinfektion gar zu oft; doch gelang uns dies mit Doz. Krompecher in 4 meiner instrumentell noch nicht behandelten Fälle, aus dem steril entnommenen Urin auf 4% Glycerin-Kartoffel. Es wäre wünschenswert, wenn die Aerzte in Fällen rätselhaft beginnender Cystitis, anstatt typische Behandlung einzuführen, erst immer diese Untersuchung machen möchten. Bleibt die 4% Glycerin-Kartoffel tagelang steril, dann fehlen die gewöhnlichen Cystitiserreger im Eiter, der Fall ist wahrscheinlich Tuberkulose.

Bezüglich des Nachweises der Bazillen mit Färbungsmethoden sind die Schwierigkeiten genügend bekannt. Der Nachweis gelang nur in etwa 50% der Fälle. Dabei, wie sich es später zeigte, haben diese spezifischen Färbungsmethoden zu Irrtümern geführt. So wurden in der Litteratur Fälle publiziert (König, Lonmeau, Milahner), in welchen auf Grund dieser Färbungen im Harne Koch's Bazillen nachgewiesen wurden und bei der histologischen Untersuchung der nephrektomisierten Niere andere Erkrankung und keine Tuberkulose konstatiert wurde. Die Ursache des Irrtums ist, dass im Smegma der Genitalien Bazillen zu finden sind, welche ebenso säurefrei sind wie der Koch'sche Bazillus. Später hat man es nachgewiesen, dass diese nicht pathogenen, säurefesten Bazillen sozusagen ubiquitäre Organismen sind, und man bestrebte sich dann, neuere Differenzial-Färbungen aufzufinden. Verfasser hat nach dreierlei Richtungen hin Untersuchungen ausgeführt:

1. Fraglich war, ob säurefeste Bazillen wirklich nur mit dem Smegma in den Harn gelangen, oder aber können solche im Blasenurin vorhanden sein? Verfasser hat in der obersten Schichte der mit ausgeglühtem Messer abgeschabten Blasen- und Ureterenschleimhaut von 15 absolut tuberkulosefreien Leichen einmal reichlich, nach Gabbet sich färbende, kurze, dicke Bazillen gefunden.

2. Da es angenommen wurde, dass die säurefesten Bazillen des Smegma dem Koch'schen Bazillus zwar gleich säurefrei sind, jedoch aber minder alkoholfest, wurden zur Differenzierung der beiden Arten neuere Färbungsmethoden angewendet. Von den neuerdings gelobten wurden die von Housell und die von Forsal empfohlenen nachgeprüft. Nach H. entfärbt man mit 3% Salzsäurealkohol 10 Minuten lang, nach F. mit 25% Salpetersäure 3 Minuten und dann mit 50% Azetonalkohol wieder 3 Minuten lang. Verfasser konnte in den nach diesen Methoden verfertigten Präparaten im Smegma niemals rotfärbig gebliebene Bazillen finden. Es muss aber bemerkt werden, dass hie und da nach Forsal auch der Koch'sche Bazillus entfärbt wurde.

3. Drittens färbte er nach H.'s und F.'s Methode solche säurefeste Bazillen, welche nicht eben aus dem Smegma der Genitalien, sondern von anderen Teilen der Körperoberfläche, oder dem Innern des menschlichen Organismus

entstammend, sich dem Urin wohl beimengen konnten. Diese waren: (a) der Möller'sche Smegmabazillus, gezüchtet aus dem Nabelsmegma, (b) Morpmann's Bazillus, gezüchtet aus dem Harne, (c) ein von Krompecher aus einem geschlossenem Pleuraexudate gezüchteter säurefester Bazillus, der bei Zimmertemperatur reichlich gedieh, und für das Tier nicht pathogen war. Dieser letztere blieb nach den beiden Färbungsmethoden ebenso gefärbt, wie der Koch'sche Bazillus; die beiden ersteren dekolorierten sich nach Forsal, blieben aber nach Housell gefärbt.

Aus diesen Versuchen resultiert, dass wenn auch selten aber immerhin auch möglicher Weise aus der Blase säurefeste Bazillen sich dem Harne beimengen können und dass auch nach den neuesten beliebten Tinktionsmethoden solche säurefeste Bazillen gefärbt bleiben, welche sich dem Harne beimengen können. Aus diesem folgt aber, dass in allen jenen tuberkuloseverdächtigen Fällen in welchen das klinische Bild ein solch' unklares ist, dass zur Aufstellung der Diagnose der jeden Zweifel ausschliessende Nachweis des Bazillus erforderlich ist, als einzig sichere Methode die Tierimpfung angewendet werden muss. Dies sind eben die noch auf die Niere beschränkten, ganz beginnenden Fälle. Zur Schnelldiagnose wäre die Tuberkulinreaktion anzuwenden, welche dem Verfasser in 4 Fällen gute Dienste leistete. Die Diagnose einer Nierentuberkulose kann man aber mit der Reaktion nur dann sicher aufstellen, wenn wir neben der allgemeinen Reaktion (Fieber) auch Herdreaktion bekommen (Nierenschmerzen, Blutung, Harnschmerz). Ist die Aetiologie der Erkrankung sicher gestellt, so folgt die Lokalisation derselben; da die Palpation oft keine Aufklärung gibt, auch manchmal irre führen kann (kollateraler Schmerz), müssen wir das Cystoskop anwenden, die intravesikale Trennung mit dem Ureterenkatheterismus ausführen. Ueber den Wert der einzelnen Verfahren möchte Verfasser nur ganz kurz bemerken, dass er die einfache Cystoskopie mit Besichtigung der Ureterenöffnungen (Meatoskopie) für ein unvollkommenes Verfahren hält, welches irre führen kann. Es war in einem Falle z. B. doppelte Nierentuberkulose mit einseitigen Blasenveränderungen verbunden etc.

Völlige Sicherheit gibt nur der beiderseitige Ureterenkatheterismus, mit welchem man sich über den Zustand jeder einzelnen Niere orientieren kann. Der getrennt aufgefangene Urin beider Seiten wird zuerst den gewöhnlichen, chemisch-mikroskopischen Untersuchungen und dann den funktionellen Prüfungen unterworfen. Er ist ein Anhänger der Kolposkopie.

Was die Indikationen für die Operationen anbetrifft, sollte nach Verfassers Meinung, ausgenommen die Fälle, in welchen multiple Tuberkuloseherde vorhanden sind, jede sicher einseitig beginnende Nierentuberkulose operiert werden.

a. Die funktionellen Untersuchungen, ergeben eine erhebliche Funktions-

störung der erkrankten Niere gegenüber der restierenden weil in diesen Fällen trotz des anscheinend frühen Stadiums grösserer Parenchymverlust und eine grössere Zerstörung bestehen.

b. Wenn auch die Funktionen der beiden Nieren nicht erheblich differieren, aber das Uebel in der Blase um die Ureterenöffnung zu konstatieren ist.

c. Wenn die subjektiven Beschwerden gross sind und dadurch das allgemeine Befinden leidet. Wenn aber bei einseitiger Bazillurie mit geringer oder fehlender Pyurie und Albuminurie die funktionelle Prüfung (bei beiderseitigen guten funktionellen Werten) keinen Unterschied ergibt, sollte der Fall unter stetiger Kontrolle erst medizinisch behandelt werden.

Tuberculosis of the Kidney.—(VON RIHMER.)

The author has studied the symptomatology and early diagnosis of beginning renal tuberculosis in about 20 cases. In the earlier stages of the disease the symptoms are often slight; in fact there is a latent period without symptoms; but even when the symptoms arouse a suspicion of urogenital tuberculosis, the diagnosis can be rendered certain only by finding the specific organism in the urine.

Animal inoculation is the only infallible method of demonstrating the bacillus. Attempts at cultivating the bacillus are unsuccessful on account of mixed infection; and the difficulties of staining the bacillus are well known. In collaboration with Dr. Krompecher, the writer succeeded in cultivating the tubercle bacillus on 4 per cent. glycerin-potato in 4 of his cases that had not been treated surgically. The urine was obtained under aseptic precautions. In spite of the admitted difficulties of cultivating the bacillus the method deserves more attention than it has received in the past, for if a 4 per cent. glycerin-potato tube remains sterile for several days, it shows that the usual causes of cystitis are absent, and the case is probably tuberculous. The author gives a résumé of his views with regard to the early diagnosis and treatment of renal tuberculosis. Whenever a cystitis begins in some obscure manner (without gonorrhea or catheter infection), and whenever a gonorrheal cystitis proves refractory to rational treatment, finally in every case of persistent pyuria, the possibility of renal tuberculosis should be borne in mind. In every case of hematuria not due to neoplasms or a nephritis, and in cases of renal colic not explained by obstruction, remember the possibility of tuberculosis should not be forgotten.

With the exception of cases in which multiple tuberculous foci are present, every case of beginning tuberculosis in which the diagnosis is positive should be treated by operation if: (*a*) the functional examination shows that the functional power of the diseased kidney is considerably diminished and (*b*)

when the function of both kidneys is not appreciably diminished, if the cystitis has passed beyond the opening of the ureters; (*c*) when subjective symptoms are severe and sufficient to impair the general health.

Tuberculosis de los Riñones.—(VON RIHMER.)

El autor ha estudiado tuberculosis renal, al principio de la afección, en cerca de veinte casos. Al principio de la enfermedad los síntomas son muchas veces ligeros, y aun existe un período latente desprovisto de síntomas; mas aun cuando los síntomas son suficientemente marcados para dar sospechas de la afección tuberculosa de los organos genito-urinales, el diagnóstico es confirmado solamente cuando el bacilo de la tuberculosis se encuentra en la orina.

La inoculación en los animales es el metodo más segura para demostrar la presencia del bacilo. El cultivo del bacilo por lo general tiene poco exito debido a la infección mixta, y bien sabidas son las dificultades que se encuentran en la coloración del bacilo. En colaboracion con el Dr. Krompecher, el autor ha logrado cultivar el bacilo de la tuberculosis en la patata glicerinada al 4% en cuatro de sus casos que no habian recivido el tratamiento quirúrgico. La orina fue colectada bajo condicionas asepticas. En vista de las dificultades que presenta el cultivo del bacilo de la tuberculosis, éste método merece mayor atención que la que hasta el presente se le ha dada, puesto que si los tubos de patata glicerinada al 4% permanecen esteriles por algunos dias, esto demuestra quelas causas usuales de cistitis son absentes y que la causa por lo tanto es de origen tuberculoso. Además de exponer los resultados de sus experimentos en el método para demostrar el bacilo dela tuberculosis, el autor da un resumen de su parecer sobre el diagnóstico prematuro y el tratamiento de la tuberculosis renal. En todos los casos en que la cistitis empieza de un modo oscuro (sin gonorrea ú otra infección), ó cuando una cistitis se muestra refractaria al tratamiento racional, finalmente en cada caso de una piuria persistente, las posibilidades de la tuberculosis renal deberán tenerse presentes. En cada caso de hematuria, que no sea debido a un neoplasma ó a una nefritis, y en los casos del cólico renal que no sea debido a una obstrucción, las posibilidades de la tuberculosis no deben olvidarse.

El autor cree que exceptuando los casos en los cuales existen varios focos de tuberculosis, cada caso de tuberculosis al principio de la infección deberá tratarse por medio de una operación bajo las condiciónes siguientes: (*a*) si el examen functional demuestra que la función del riñon afectado ha disminuido conciderablemente; (*b*), cuando la función de ambos rinones no ha disminuido apreciablemente, cuando la cistitus no ha pasado mas allá de la abertura de los uréteres; (*c*) cuando los síntomas subjectivos son severos y suficientes para causar un desconcierto de la salud general.

A STUDY ON EXPERIMENTAL TUBERCULOSIS OF THE TESTICLE.

By Ch. Esmonet,

Of Châtel-Guyon, Chief of the Civiale Laboratory (Lariboisière, Paris).

We have caused the tuberculization of the testicle by puncture and by injection into the vas deferens, into the general venous system, and into the spermatic artery.

1. Tuberculization of the Testicle by Puncture.

Exp. I.—Dog No. 13, weighing 12 kilograms, in the same time as an injection of bouillon of human tuberculosis in the right spermatic artery, has received in the left testicle 1 c.c. of the same bouillon by multiple punctures (March 25th).

March 28th: Both testicles are hard and painful.

April 2d: Both testicles are taken away.

The state of the right testicle will be described later.

The left testicle presents several spots about the size of the head of a pin. When examined with a microscope, those spots appear to correspond with foci of tuberculous infiltration, and on their level one finds seminiparous tubes blended together. On the periphery of the infiltration may be found all the intermediate stages of spermatic catarrh. Sometimes the tubes present a total desquamation of the epithelium. The nuclei cannot be stained; spermatozoa can scarcely be recognized by their feebly taking hematoxylin. In places the seminal epithelium looks normal, has its ordinary reactions with stains, and allows the distinction of numerous spermatozoids.

Exp. II.—Dog No. 41, weighing 11½ kilograms. April 1st: Multiple punctures in the left testicle with 1 c.c. of emulsion of bacilli from tuberculous mammitis of a cow. The right testicle is left untouched.

April 19th: Nearly dying animal killed with cyanid of potassium. The right testicle is normal by the naked eye. With a microscope, one may see epithelium in the state of pre-spermatogenesis.

The left testicle presents small reddish points scattered about in the parenchyma. The volume of the testicle does not exceed that of the other one.

By microscopical examination one finds foci of tuberculous infiltration, pretty well limited, not yet necrotic, and characterized by an extreme abundance of polynuclears, many of which seem to be in a state of karyolysis, showing clearly, by the acute coloration of their nuclei on the ground of the intertubular tissue; while most of the elements of the connective tissue are scarcely colored, and seem to be about to disappear. Koch's bacilli are abundant.

The seminiparous tubes that are in contact with tuberculous nodules present an epithelium desquamated in a lump, where nothing clear may be distinguished. The tubes which are distant from the tuberculous foci present a normal appearance. Their epithelium is in a state of pre-spermatogenesis.

The other organs are somewhat discolored. The liver is yellowish, fat, very soft. Histological examination shows numerous tuberculous granulations in a beginning stage. Glycogen has completely disappeared from the liver, except about the granulations.

The parenchyma of the kidney presents granular and fatty degeneration, easily seen on a level with the tubuli contorti. Small but numerous hemorrhages are scattered everywhere.

Dog No. 22 received by multiple punctures about 1 c.c. of bouillon emulsion of human bacilli in the right testicle, which became congested, hemorrhagic at all the points of puncture. The epididymis seemed much injured.

In short, injections in the parenchyma give much better results than injection by the vas deferens.

2. Injections of Koch's Bacilli in the General Venous Circulation.

Exp. III.—Dog No. 3, weighing 11.1 kilograms.

Jan. 27th: Venous injection of human tuberculosis: 3 c.c. of bouillon emulsion. Repeated traumatisms of the right testicle. The animal presenting no change, subcutaneous injection of tuberculin was made on March 4th. Weight 13.3 kilograms.

March 28th: Good health. Weight 14.2 kilograms.

April 1st: Venous injection of bacilli from tuberculous mammitis of a cow—3 c.c.

June 6th: Weight 11.5 kilograms. Emaciation. Cachexia.

The animal was killed on April 8th. Generalized tuberculosis. The testicles are normal. Numerous spermatozoa and glycogen are found in the testicles.

Former traumatisms seem to have had in this case no action on the localization of tuberculosis, the right testicle being untouched. The action of bovine tuberculosis seems to have been more striking than that of the human bacilli, all reserves made about the predisposing part played in this case by the former injections of human tuberculosis.

Exp. IV.—Dog No. 2, weighing 8 kilograms.

Oct. 29th: Injection of tuberculosis from bovine mammitis in the vein of the ear, 3 c.c. of bouillon emulsion.

Nov. 25th: Sacrificed while very sick (twenty-seventh day). Right testicle, in inguinal ectopia. Left testicle, normal aspect, color, consistency. By microscopical examination no lesion seen in the testicle, right or left. The ectopic testicle has no differentiated cells. The left one is full of spermatozoa.

The animal has died from generalized granulia, histologically recognized in the liver, spleen, lungs, kidneys.

Exp. V.—Dog No. 50. Intravenous injection of human tuberculosis thirty-three days before. Slight beginning of granulia in the liver and lungs. Some granulations under the pleura. Nothing in the testicle. Normal spermatogenesis.

Exp. VI.—Dog No. 5. Intravenous injection of human tuberculosis sixty days before. Killed. Generalized granulia. No appreciable lesion in the testicle. Normal spermatogenesis.

Exp. VII.—Dog No. 4. Weight 15 kilograms.

July 15th: Injection of human tuberculosis by the venous way; 3 c.c. Killed on the sixtieth day in a state of cachexia. Weight 11.5 kilograms. Generalized granulia, histologically verified. The testicles are normal from a macroscopical point of view. With the microscope no alteration can be seen in the albuginea or in the connective tissue. No vaso-dilatation, no hemorrhage, no formation resembling a nodule in any way.

The wall of the seminiparous tubes is normal. In the epithelium ordinary layers of spermatogonias, spermatocytes, spermatoids, and spermatozoa. But no tube is normal in regard with the aspect of the seminal cells. Instead of being individualized, they agglomerate, especially on a level with the layers of spermatocytes. Besides their coloring reactions, the morphology of their nuclei remains normal. But instead of finding one nucleus for each cell, one may see everywhere, side by side, protoplasmic blocks that represent the union of eight or ten spermatocytic cells. The nuclei remain very clear, well colored, in these protoplasmic masses, each of which is clearly rounded, well limited outwardly, and presents neither on the edge nor in the interior the least mark of constriction or of a beginning division.

Besides these protoplasmic groups, epithelial cells may be found with normal characters. Moreover, the varieties are related to the number of nuclei from the protoplasmic plates with many nuclei to the seminal cell in one of its normal stages. No focus of caseation exists on a level with those formations. Everything equally takes stain. Multiple trials of coloration of Koch's bacilli are fruitless. Spermatozoa are abundant.

We think we are here in presence of a case of spermatogenesis with an abnormal evolution, on account of the tuberculosis and of the tuberculous toxins circulating in the blood and causing deviation of the genital function from a morphological point of view. This is the only case of this kind we have seen. In fact, we have reproduced, by injection of infectious agents, of tuberculosis especially, in the spermatic arteries, catarrhal lesions of the seminiparous tubes, causing lesions in the epithelium looking, at first sight, like the pseudo giant-cells we met with in the above case. But it is easy to ascertain that in those cases of catarrh there are alterations of the protoplasm unequally or not at all colored. The nuclei seem to conglomerate. But their chromatic filaments dilate before they disaggregate, till they reach a volume three or four times greater than normal. They are colored intensely. One may see them segmenting, reducing to small balls, resembling the changes in karyolysis. There is nothing comparable here.

In short, the trials of tuberculization of the testicle by the venous channels have not been successful in the dog. The only lesion we have been able to obtain, and that in only one case, is an abnormal evolution of spermatogenesis.

We believe it possible to cause testicular tuberculosis by the general

venous circulation in the dog; but this process is uncertain, and we prefer the injection by the way of the spermatic artery. It seems possible that experimental tuberculosis of the testicle in the dog may be obtained in conditions analogous to those one must realize to determine the same lesion in guinea-pigs.

In the guinea-pig, when tuberculization is rapid, tuberculous foci, macroscopically perceptible, are seldom found in the testicle. When tuberculization is slow, one may see the testicle enlarging, presenting caseous nodules from the size of a pin's head to that of a hemp-seed; sometimes the whole testicle becomes a caseous mass.

Three guinea-pigs, inoculated in the pleura on March 12, 1902, with half a cubic centimeter of bouillon emulsion of Koch's bacilli, died nine or ten months afterward. All of them presented generalized tuberculosis; two of them had very deep tuberculization of the testicle; the third one some granulations not very far advanced.

3. Injections of Koch's Bacilli in the Vas Deferens.

Exp. VIII.—In a first trial we injected into the deferent canal an emulsion containing many Koch's bacilli. A temporary ligature around the needle caused the emulsion to go high in the spermatic vessels. Five minutes after the injection the ligature was removed, the needle taken away, and the wound closed.

The animal presented no symptom, either local or general, during the days or weeks that followed. Two months afterward, ablation of the testicles showed that the two glands were absolutely uninjured, the epithelium normal, with numerous spermatozoa. Nothing in the interstitial tissue or epididymis or deferent canal. Bladder and kidneys were normal. The lumbar glands were histologically unchanged. It seems that Koch's bacilli had been little by little carried toward the bladder by the sperm, and afterward evacuated with the urine, without causing any tuberculous lesion.

We have repeated this experiment, always with a ligature on the deferent canal, but at the same time we injured the spermatic vessels or the testicle. We made the ligature of the spermatic artery so as to facilitate the infection of the gland, by causing, at least for a time, epithelial alterations that should give more easy access of the bacilli to the interstitial tissue.

Moreover, we have injured the testicle and the deferent canal.

Exp. IX.—Dog No. 15, weight 21 kilograms.

Nov. 19th: *Right testicle:* Ligature of the spermatic artery. Injection of 15 drops of emulsion from bovine mammitis into the vas deferens. *Left testicle:* Injection of tuberculosis from mammitis in the vas deferens, after having excoriated it with the needle and after having injured the testicle. No reaction in the epididymis and testicles on the following days.

December 20th: Both testicles seem to have lost volume, especially the right one, harder and more embossed.

Jan. 12th (fifty-fourth day): Ablation of both testicles. *Right testicle:* It weighs 7 grs., is atrophied and hard; presents in its center a whitish, indurated, not caseous block. *Left testicle:* It weighs 14 grs. Its appearance is whitish and it is very hard.

On the right side, the testicle is represented by a block of embryonal infiltration, showing no outline of seminiparous tubes. Numerous bacilli are found. The atrophied testicle is inclosed by the epididymis, surrounding it almost completely. The appearance of the testicle is normal in most places. In other places the interstitial tissue is deeply infiltrated.

On the left side, a large block of embryonal infiltration, with numerous bacilli, is found in contact with the canals. The seminiparous tubes have desquamated. No signs of spermatogenesis are found. A profuse network shows a recent seminal catarrh with the formation of large catarrhal cells. These lesions exist only where the interstitial tissue is infiltrated. Where there is no infiltration, the seminal epithelium has its normal characters, its numerous spermatozoa. One may find fat remaining in the interstitial spaces, even in a tuberculous focus. The seminiparous tubes are all wholly free from fat.

The animal is killed two months afterward. There is no evidence of tuberculous foci.

In the following experiment we did not injure the excretory and secretory spermatic canals, but we injected the tuberculous culture into the deferent canals after having ligatured it around the needle.

Exp. X.—Dog No. 16, big dog, very young, weighing 17 kilograms. Both testicles are very small.

January 17th: Ligature of both deferent canals and injection of human tuberculosis. No inflammatory reaction.

February 9th: The testicles are very hard.

The dog was killed on the thirtieth day after ligature. Nothing found in the organs. The liver is somewhat discolored. It is fat, but contains no tubercle. The right testicle weighs 10 grs.; the left one 11 grs. The epididymis on both sides is hard. The canals are transparent and dilated. No tuberculous nodule macroscopically appreciable. The testicle seems to be histologically normal, but no spermatozoa are found. Both testicles are much glycogenated.

The absence of spermatozoa seems to be due to the age of the animal. It is a testicle in a state of pre-spermatogenesis, where the seminal epithelial cells are alike.

In this case, notwithstanding the great quantity of injected bacilli, the result has been *nil*, at least for the testicular parenchyma. Thirty days after the puncture the deferent and epididymal canals were still distended by the injection, and colorable Koch's bacilli were found in it. But we could scarcely detect a beginning infiltration in the connective tissue near to the epididymal canal. Epithelium of the canaliculi seems to have retained its integrity. One may see how uncertain is the method of tuberculization by way of the deferens. Notwithstanding the retention of Koch's bacilli, there was little or no infection of the adjacent tissues.

4. Injections of Koch's Bacilli in the Spermatic Artery.

The injections of tuberculous bacilli in the dog's spermatic artery were made with human bacilli or bovine bacilli of tuberculous mammitis. The testicles were taken away at intervals varying from twenty-four hours to sixty-eight days. In nine cases we obtained a more or less extensive tuberculous infiltration with concomitant tubular lesions. In one case the testicle was the seat of advanced caseation.

In four testicles we were able to discover no lesions. The testicles of the first dog were examined twenty-four hours after the injection, so we could not expect to find anything. In the second dog (No. 9) the same injection made in the spermatic artery, right or left, has given but a negative result for the left testicle on the twenty-fifth day, and a very light result for the right testicle on the forty-fifth day.

Exp. XI.—Dog No. 13. Weight 12.5 kilograms.

March 25th: Injection in the right spermatic artery of 1.5 c.c. of bouillon emulsion of human bacilli. On the left side the testicle was repeatedly punctured.

March 28th: Weight 12 kilograms. Both testicles are hard and painful.

April 2d (seventh day after injection): Both testicles are red and tumefied. The right testicle is uniformly congested, with whitish patches, showing distinctly on the red background.

The left one presents lesions already described, in connection with experimental tuberculosis of the testicle by puncture of the parenchyma.

Exp. XII.—Dog No. 8, weighing 23.5 kilograms.

March 25th: Injection in the left spermatic artery of 1.5 c.c. of bouillon emulsion tuberculous mammitis (bovine).

March 28th: Weight, 22 kilograms. Testicles large and painful.

April 1st: The testicle keeps enlarged, but is no more painful.

April 12th (seventeenth day after injection): The left testicle is taken away. It is large and heavy. It presents a very striking asymmetry on one side. It is very much congested, with yellowish blots showing clearly on the red ground. On the other side the testicle is less voluminous and of a normal grayish color.

By microscopical examination ordinary lesions of the tuberculous testicle may be seen; the infiltration divided in more or less disseminated nodules; confluent in the reddish part of the testicle; more discrete elsewhere. Among the tuberculous nodules one may find the tubes curled up, with a crumpled wall, containing few cells, showing no signs of spermatogenetic process. The tubes that remain present very accentuated catarrhal lesions. The most peripheral layer persists alone, with its normal layers, and one may find in the tube an abundant hairy net with fine ramifications, where the seminal cells have desquamated.

Exp. XIII.—Dog No. 10, weighing 21.5 kilograms.

April 15th: Injection in the spermatic arteries, right and left, of 2 c.c. of bouillon emulsion of bovine bacilli of tuberculous mammitis.

April 19th: Both testicles are enlarged. The general state is good.

May 3d: Ablation of the right testicle (eighteenth day). Lobulated appearance of the testicle. One may see fine transparent granulations, that become distinctly of a milky white, on the grayish background of the testicle after a short stay in alcohol or formalin. This testicle presents multiple nodules of tuberculous interstitial infiltration, inclosing a good many tubes. The tubes are desquamating everywhere. In this desquamating epithelium one may find a few pseudo-giant-cells.

May 4th: Injection of 2 c.c. of tuberculin.

May 7th: Ablation of the left testicle (twenty-second day). The appearance is analogous to that of the right one. The animal weighs 22.5 kilograms.

The left testicle, by microscopical examination, presents a diffuse tuberculous infiltration, nearly equally divided between the tubes. The tubes are desquamated, except the first layer of cells adherent to the wall. The hairy net is abundant. One may see a very marked thickening of the vascular walls.

Exp. XIV.—Dog No. 14, weighing 25 kilograms.

April 1st: Injection of the right and left spermatic arteries with 1 c.c. of human tuberculosis emulsion.

April 19th: Weight, 20.4 kilograms. The right testicle is hard and firm. The left one is not easily perceptible on account of a very marked edema. The wound suppurates abundantly.

April 29th: Ablation of the left testicle (twentieth day). It is firm, presenting nodosities of the volume of a pea, whitish, hard, inclosed in a parenchyma more gray than normal. These nodules are especially scattered at the periphery of the testicle. In one point they conglomerate and form a hard nucleus of the volume of a small hazelnut.

The microscopical aspect is exactly the same as that of the left testicle described in the fifteenth experiment. In both of them one may see the same interstitial infiltration with polynuclear leukocytes and numerous mononuclear elements, lymphocytes especially, the same desquamative process of the epithelium, and the same aspect of false giant-cells due to this desquamation, the same abundance of Koch's bacilli infiltrating the whole tissue. The epithelial desquamation shows all the intermediary stages described. This testicle contains no glycogen, except on a level with the tubercles that contain much of it.

The right testicle is taken away on June 8th (sixty-eighth day after the intervention). The wound suppurated without interruption; the animal grew thin. It weighs 20.8 kilograms.

The testicle is atrophic, the size of a hazelnut. It presents voluminous cicatricial loops, with but a small amount of yellow testicular parenchyma. This testicle contains no glycogen. We failed to find Koch's bacilli. We think that the suppuration has played in some way a curing part, not directly on Koch's bacilli, but by determining an unceasing afflux of migratory elements, a particularly intensive and persistent reaction in all the surrounding tissue. When the new elements arrived, injured in their turn by the necrosing process, they must have been eliminated by the wound, taking out with them the testicular tissue and the bacilli.

Under these conditions, by doing away with the organ, general infection seems to have been avoided. We shall see, when describing the orchitis

produced by injections of hydro-alcoholic solution of naphthol, that we have tried to produce a curative process comparable to this one, avoiding the aid of pyogenic microbes, which may determine remote complications which cannot be foreseen.

Exp. XV.—Dog No. 10. Weighing 21.5 kilograms. (Testicle taken away on the twenty-second day. See further on.)

Exp. XVI.—Dog No. 6. Weighing 25.3 kilograms.

September 26th: Injection in the right and left spermatic arteries, of 5 drops of bouillon emulsion of tuberculous mammitis (bovine).

September 27th: Slight reaction of the testicles.

October 5th: There is no more tumefaction or pain.

October 18th: Good general condition. The right testicle is big and hard.

October 29th: The general condition is bad. Weight 24.1 kilograms. Ablation of the left testicle (thirty-third day). It is somewhat enlarged. On a section, it is pink, with numerous small, red points. Many whitish points of the size of a pin's head may be seen. In the epididymis a big whitish and hard nucleus. No focus undergoing caseation. On microscopical examination one may note the infiltration of most of the testicle in more or less extensive plaques, where no remainder of tubes may be found. Polynuclears and lymphocytes form the greater part of that infiltration. On the periphery of the infiltration one may recognize tubes where remain the last vestiges of seminal epithelium. The hairy net is abundant and fine. Some tubes, the walls of which seem to be very little or not at all injured, are filled with the cellular elements that form the infiltration. It appears that the wall of the tube has given way at another point than that through which the section is made, and that the infiltration has passed through the lumen of the tube.

The animal grew thin during the following weeks. It became cachectic, and died in the night of November 16th (fifty-second day after injection). At the post-mortem the spleen is large, red, and firm. The liver presents alternately red and yellow color. Fine transparent tubercles on the pleura and peritoneum. The kidneys are yellowish and show biliary infiltration. The urine is icteric and presents Gmelin's reaction. Nothing in the spermatic vessels nor in the bladder.

Ablation of the right testicle (fifty-second day). It is not very much enlarged, but very hard. There is no liquid in the tunica vaginalis testis. The albuginea is thickened. On section of the testicle numerous spots of a golden yellow, from the size of a pin's head to that of a little pea, show distinctly on the grayish ground. Same granulations on the epididymis. The testicle, put in formalin in contact with the air, shows after some hours, instead of the golden yellow spots, some greenish spots due to the changes of the bile.

When one looks through the section with the naked eye one may see, in a preparation colored with hematin-eosin, the caseous nuclei forming very broad and irregular spots feebly stained pink. In the intervals the infiltrated and not yet caseous parts are more or less intensely stained by hematin.

With a lens one may find in the caseous foci a great number of Koch's bacilli. The tiny part of infiltrated testicular parenchyma is filled with Koch's bacilli.

Exp. XVII.—Dog No. 11. Weighing 27 kilograms.

January 11th: Injection in the spermatic artery of 4 drops of a dilution containing a few Koch's bacilli (human). On the left, injection of two drops. No inflammatory reaction with respect to the testicles; they present but little tenderness. The general state remains good, though the animal gets thin. It weighs 23 kilograms on February 23d, when both testicles are taken out (forty-second day).

By microscopical examination one may see that the testicle is normal almost throughout. The epithelium presents numerous spermatozoa. At some points one may find a very discrete beginning of embryonic infiltration in the interstitial tissue. On that level the neighboring tubes present an acute epithelial desquamation, there are no more spermatozoa, and in the tube some giant forms may be found.

We must attribute the small extent of the lesions to the small amount of bacilli we injected. If we had injected bovine tuberculosis, it is probable that the lesions would have been more distinct.

Exp. XVIII.—Dog No. 12. Weighing 16 kilograms.

September 23d: Injection in the right and left spermatic arteries of 2 c.c. of bouillon dilution of human tuberculosis. Slight inflammatory reaction in both testes, especially in the left one, where the pain is very sharp.

October 5th: Good general condition. Ablation of the right testicle (twelfth day) very firm, somewhat pink, bleeding when it is cut. By histological examination, discrete and slight infiltration in the interstitial tissue, with easily stained bacilli. The epithelium is about to desquamate, but some cells remain in the tubes, and the forms of giant desquamative cells are abundant.

October 19th: The dog died. Autopsy on the 20th: The left testicle (twenty-seventh day) presents a caseous, whitish block fitted in a crescent of less altered parenchyma. Everywhere the testicle is affected with edema. Macroscopically nothing can be seen in the viscera except in the liver, which is alternately red and yellow, instead of presenting the uniform red color usual in dogs.

Microscopical examination of the non-caseous testicular parenchyma shows a complete necrosis. Everything is colored in the same way by eosin, including the cells forming the infiltration, except on a very limited spot where numerous polynuclears are stained. Generalized granulia in the lungs, liver, and kidneys, verified by microscopical examination and by the coloration of Koch's bacilli.

Exp. XIX.—Dog No. 6. Caseous testicle (fifty-second day). (See 18th exp.)

Exp. XX.—Dog No. 7. Weighing 25 kilograms.

January 17th: Injection in the right and left spermatic arteries of 1 c.c. of emulsion of bacilli of human tuberculosis. This dog, very emaciated at the time, died on the next day. Nothing is found in the organs. The testicles have their normal appearance. The interstitial tissue is normal. The seminal tubes present their normal epithelium with numerous spermatozoa. Perhaps there is a very slight degree of seminal catarrh. It seems that there is in the spermatic magma an abnormal number of immature elements or spermatocytes.

Exp. XXI.—Dog No. 9. Weighing 25 kilograms.

February 1st: Injection in both spermatic arteries of 10 drops of bouillon emulsion of human bacilli.

February 25th: Very good general condition. Ablation of the left testicle (twenty-fifth day). No lesion may be found in the testicle. The tubes have their normal aspect, spermatozoa are numerous, the interstitial tissue presents no modification. This testicle, except on a level with some rare tubes, contains no glycogen.

March 15th: Weight 23 kilograms. Ablation of the right testicle (forty-third day). Normal aspect, somewhat firmer consistency. On section, two or three reddish points. By microscopical examination one may ascertain the presence at such a point of a small nodule of embryonal infiltration, presenting numerous polynuclears and lymphocytes with peripheral congestion. It contains no colorable Koch's bacilli.

We cannot explain the complete failure of the injection for the left testicle. The animal, killed some time after other experiments, presented no trace of tuberculization.

In short, the injections of tuberculosis (human or bovine) in the spermatic artery have in nearly all the cases determined an extensive tuberculization and killed the animal by propagation of the tuberculosis to other viscera. The results given by these injections show that the inflammatory reactions of the testicle are changeable, but generally not intense. The testicles, in the days that follow the injection, are somewhat large and painful, but these symptoms quickly disappear; and after five, six, or ten days nothing more is appreciable.

As for the general condition, during some time it is satisfactory. Our dogs, coming from the police station, were not in a very good condition, and most of them, in the days following the injection, have grown fatter. We have found no appreciable lesions in dogs whose testicles have been examined soon after death (exp. No. XX)—twenty-four hours, for instance. No interstitial or epithelial reaction was histologically appreciable, and we could discover, with difficulty, some bacilli colored with Ziehl's reagent disseminated in the intertubular tissue.

After seven days (exp. No. XI) one may recognize microscopical lesions, the testicle is congested, presents small white points, somewhat difficult to distinguish at first sight, but which become very visible after a short stay in formalin or alcohol at 60° or 90°. So after seven days the tuberculous nodules may sometimes be detected in the interstitial tissue of the testicle. Yet there is a marked proliferation of the elements of the connective tissue, but we specially note the presence of large quantities of polynuclear leukocytes, with mononuclears and especially lymphocytes.

The tubes near the tuberculous infiltration are affected in a great number of cases. The tubes somewhat far from the nodules seem unaffected, and present a normal epithelium containing much glycogen, and as much fat in the seminiparous epithelium as in the interstitial cells.

It is sure, contrary to former opinions, and according to actual histological observations as to the pseudo-endothelium of the seminial canaliculi, that the development of the tubercle takes place in the connective tissue, by means of mesodermic elements of hematic or connective tissue origin. They infiltrate the interstitial tissue, find their way between the tubes, and surround them completely. This is exactly the mode of invasion we found on a level with the variolous nodule. Tuberculosis of the testis has never injured a tube at the beginning; it affects several of them at the same time, almost always in the part near to the intertubular zone invaded by the disease. On the seventeenth, eighteenth, or nineteenth day, the lesions generally show distinctly, as much in the tubes as in the epithelium. At this time the tuberculous infection generally reaches nearly all the interstitial tissue. The tubes disappear amidst the nodules, and those that are not yet completely invaded present advanced lesions of their epithelium, comparable to those we found in man during smallpox, though differing in a few characters.

At times, in fact, the epithelium of the tubes becomes necrosed en masse. Everything desquamates at the same time and falls in the lumen of the tube. Protoplasm and nuclei stain no more. Along the wall remain a few cells, with abundant protoplasm, a voluminous, compact, and feebly colored nucleus. We find these cells in all the cases of seminal catarrh, observed as often in man as in animals.

Sometimes the cells remain only along the walls; more often one may see long and thin entangled filaments, the remainder of the homogeneous intercellular tissue of the normal seminal epithelium; sometimes this substance has been injured at the same time as the cells, and everything has desquamated together; but more often it holds out and lets go the cells it contained as in a net, and then a fine and slender hairy plexus remains.

Often the necrosing process injuring the epithelial cells produces voluminous cellular forms, which resemble giant-cells, but are easily differentiated by the aspect of their protoplasm and of their nuclear remains. These forms of seminal catarrh are especially numerous in the tubes at the periphery of the tuberculous nodule.

After the very quick fall of spermatozoa and spermatids, after some spermatocytes, presenting their normal nucleus, have desquamated, the cells still retained in the hairy plexus show a protoplasm with more or less distinct outlines, and especially a peculiar state of the nuclear filament that swells up to three or four times its normal size. This modification may affect the nuclear filament in one of the stages of spermatogenesis, causing infinite diversity in the forms of necrosis. It reminds of spermatogonia, spermatocytes, or giant spermatids. That filament stains very strongly, and keeps for a long time this character, like the spermatozoa one may find in the testicular magma.

The tubes inclosed in the nodule itself present but a few cells joined to the wall and a more or less distinct hairy plexus. The intertubular proliferation invades the layers of the wall, creeps between them, bursts out in the tube, which it makes unrecognizable after a few days.

The interstitial tissue, during the weeks that follow, presents the same characters. The leukocytic infiltration with polynuclear cells prevails, though the number of cells with one nucleus, and especially lymphocytes, seems to increase. Little by little all the elements of the nodule take less color. Karyolysis is much accentuated. Caseation of the tuberculous nodule happens, and, soon after, only the numerous heaps of Koch's bacilli may be well stained in that caseous focus.

At this moment, if one looks by transparency at a stained section, one may clearly see the caseous foci, disseminated in the whole testicle, and sometimes confluent, so as to leave only narrow bands of infiltrated tissue replacing the testicular parenchyma.

At no time, and it seemed to us in no organ, does the dog present the giant-cell so frequent in tuberculosis of man and the guinea-pig. We have been struck by the long resistance of interstitial cells inclosed in the tuberculous nodule. In preparations stained with osmic acid they are clearly visible four or five weeks after the injection, when the tubes have completely disappeared.

While these lesions are going on in the testicle, the rest of the organism is affected by tuberculosis. Generally the testicle becomes caseous toward the eighth or ninth week. At this time the animal is very sick, and, after death, presents a generalized granulia, specially perceptible about the liver,* the lungs, the bladder, the pleura, and the peritoneum. In all the cases where the quantity of tuberculous bacilli injected in the spermatic artery is sufficient to determine an acute tuberculosis we have obtained generalization in a short time. It seems that with equal doses of microbes, tuberculization occurs more quickly in this way than by injection into the general venous system. The testicle is, for Koch's bacilli, a culture-medium very favorable in the dog, and the bacteriological examination seems to confirm this opinion. In fact, the quantities of injected culture were practically equal, being gathered, emulsioned, injected in similar conditions. Bacteriological examination, made a very short time after the injection, showed but a small quantity of Koch's bacilli; after a long time there were many bacilli—a fact which we must attribute to the growth of bacilli in situ. A

* In several cases, dogs have presented a remarkable icterus, recognizable in the yellowish color of the sclerotic, by the dark urine, giving Gmelin's reaction. At autopsy the organs presented a variable, sometimes very distinct, degree of biliary imbibition. In the sixteenth experiment, especially, the caseous nuclei of the testicle were colored yellow, which became of a clear green after some hours in a solution of formalin exposed to air.

feeble dose of bacilli injected in a dog's testicle produces sometimes granulia and death more quickly than injection into the general venous system. We have no data about the rapidity with which the tuberculization takes place through the pleura or peritoneum.

We must describe another peculiar point in the tuberculization by human bacilli and the bacilli coming from the tuberculous mammitis of cows. The dog seems more sensitive to the latter than to the former; while the guinea-pig reacts as readily to the one as to the other. In dog No. 11, for instance, very small doses (2 or 4 drops of bouillon emulsion of bovine tuberculosis) caused special nodules, which similar injections made with bacilli of human tuberculosis could not have caused. According to Nocard and Leclainche, the dog does not react to intravenous and intraperitoneal injections of tubercle bacilli from birds.

Injections of tuberculin made under the skin during the experimental tuberculosis of the testicle do not seem to produce any histological change showing after four days (dog No. 10, exp. XIII). It appears that to study the local reactions of the tuberculous nodule to tuberculin, the method of intraspermatic injections is preferable to any other process.

We tried to find out which would be the results of ablation of the testicles after experimental tuberculization, and whether the generalization could be avoided in this way. In dogs where the ablation of tuberculous testicles has been done on the seventh, eighteenth, or twenty-second day, we could find no tuberculosis in other parts of the body. The animals continued in good health, and when killed for experiment of another kind, they presented no sign of tuberculosis.

In dogs where the ablation of the testicle was performed only after forty-two, forty-five, fifty-two, and sixty-eight days we found on post-mortem examination a generalized granulia. Those that were not killed at that moment demonstrated by their emaciation that tuberculosis was not confined to the testicle. In one case, although the testicles had been taken away, one on the twelfth, the other on the twenty-sixth day, the animal died of generalized tuberculosis. In another dog the general condition on the forty-fifth day was satisfactory, notwithstanding a slight emaciation. In the first case we had injected 2 c.c., in a second 10 drops of bouillon emulsion of human tuberculosis. One concludes from these data that a comparatively early ablation of the tuberculized testicles of a dog prevents generalization in nearly all the cases.

5. Injections of Koch's Tuberculin in the Spermatic Artery.

Exp. XXII.—Dog No. 18. Weighing 35 kilograms.

November 28th: Injection in the right spermatic artery of 1 c.c. of tuberculin in 2 c.c. of bouillon; and in the left spermatic artery, 10 drops of non-

diluted tuberculin. On the following day the testicles are very swollen and painful.

December 10th: Tumefaction and pain have disappeared.

December 20th: The testicles are no more painful, but they seem somewhat hard.

January 12th (forty-fifth day): Ablation of both testicles. On the right side the testicle must be dissected out of the fibrous mass which surrounds it. The whole gland is indurated. On the left side the enlarged testicle shows only a few adhesions of sclerosis. Epithelium contains no spermatogenetic forms. Spermatozoa and spermatids are missing. In the rest of the epithelium, very compact, the nuclei of the cells are somewhat different as you examine the most axial or the most peripheral stratum. The nuclei of the cells corresponding to the layer of spermatogonia is homogeneous and deeply colored. The cells of the most internal layer present a nucleus whose chromatic filament is feebly colored, equally distributed through the nucleus, without presenting the evolution forms of the normal spermatocyte.

The vascular walls are very much thickened. The examination by osmic acid shows that these cells are filled up with fat, more abundant than is normal and disposed in unequal droplets, attesting an acute granular and fatty degeneration.

Exp. XXIII.—Dog No. 19. Weighing 27 kilograms.

April 23d: Injection in the left spermatic artery of 5 drops of tuberculin in 2 c.c. of bouillon; in the right spermatic artery, 30 drops of tuberculin in 2 c.c. of bouillon.

April 25th: Both testicles are large and painful.

May 3d: Ablation of the right testicle (thirteenth day). This testicle is completely necrosed. All the central part is stained pale pink by hematin-eosin. The periphery presents an area 4 or 5 millimeters broad, of deep infiltration, of leukocytes which are for the most part polynuclears. All the leukocytes are united, and give the preparation an aspect similar to what we have noticed after the intraspermatic injections of Eberth's toxin.

June 6th (forty-second day), ablation of the left testicle. It is of a brownish color, hard, with sclerous bands surrounding the lobules. The periphery of the testicular parenchyma is of a yellowish color, perhaps a vestige of former hemorrhages.

The results given by injection of Koch's tuberculin in the spermatic arteries may be summarized. After an immediate inflammatory reaction, which may go as far as complete necrosis of the gland (Exp. XXIII, right testis), the inflammatory phenomena quickly mend in ten or twelve days. A sclerosing process peculiarly intense and with a quick evolution affects the testicle partly (Exp. XXIII, left testicle) or wholly (Exp. XXII, right testicle) from the forty-second and forty-fifth day. The effect on the testicle may be less severe, either by reason of greater dilution of the tuberculin, or rather by the exposure of this tuberculin, for some time, to air and sunshine. The left testicle of the dog No. 18 (Exp. XXII) shows but a small reaction in the interstitial tissue. In the epithelium, if it is completely desquamated from the beginning and mends little by little, or if the same initial lesions

persist during a long time, its spermatogenetic function is abolished, and the presence of spermatids and spermatozoa can no more be detected. Besides, a fact that may seem less in favor of an epithelial restoration than of a slow degeneration, the cells present a great number of fatty granulations.

We have begun examining the reaction of the testicle, after punctures, intradeferential injections, and intraspermatic injections, with regard to tuberculous poisons, ethero-bacillin, chloroformo-bacillin, which M. Auclair has been kind enough to give us.

6. Injections of Naphthol Through the Spermatic Artery in the Normal Testicle.

Exp. XXIV.—Dog No. 33, weighing 15 kilograms.

October 7th: Injection in the right and left spermatic arteries, of 10 drops of hydro-alcoholic solution of naphthol. On the following days both testicles are very swollen and painful.

October 25th (eighteenth day): Both testicles are very soft. The right testicle is taken away. It is red, congested everywhere, but especially in some regions, having the shape of wedges directed toward Highmore's body. By microscopical examination the appearance of this testicle resembles the testicles taken away a short time after ligature of the spermatic artery. It differs, however, by the fact that the considerable increase of interstitial tissue is due not to hemorrhage, but to an acute infiltration, mostly of polynuclear leukocytes. The proliferation of the cells of connective tissue is not very well marked. The epithelium of the seminiparous tubes is necrosed. It takes no color. The cells form a homogeneous block in the tubes. The split cells set free the fat in the tubes, in the connective spaces, in the lymphatic vessels, in the veins.

October 26th: The animal, which seems to be sick and has lost 1 kilogram of weight, is killed. The left testicle is taken away (nineteenth day). A part of the testicle, although somewhat pink, seems normal. The remains present reddish foci comparable to those of the first testicle. Histological examination gives the same results as for the right testicle.

Exp. XXV.—Dog No. 40, weighing 17 kilograms.

July 1st: Injection of 10 drops of hydro-alcoholic solution of naphthol in both spermatic arteries. During the following days, tumefaction and pain in the scrotum. The animal is not in good health.

July 15th: The dog seems to get better. It weighs 16.2 kilograms.

November 12th: Both testicles are very small and hard, they cannot be easily perceived through the scrotum, they are retracted toward the external inguinal ring. When taken away, they appear of the size of a bean, very hard, sclerosed, and difficult to cut. In some places a small quantity of testicular parenchyma persists of a yellowish tint, showing the former existence of hemorrhages at this point. The inguinal glands shows nothing at all, but the lumbar glands are smaller than usual, sclerosed, and hard on section, especially at the periphery. They have not been examined histologically, but on section they show a very hard white cortical zone, looking like cicatricial tissue.

7. Treatment of Testicular Tuberculosis by Injection of Naphthol Through Spermatic Artery in the Previously Tuberculized Testicle.

The sclerosis obtained with naphthol drove us to think that perhaps the evolution of the testicular infection due to Koch's bacilli could be modified in a favorable way.

Exp. XXVI.—Dog weighing 22 kilograms.

October 7th: Injection of 1.5 c.c. of bouillon emulsion of Koch's bacilli in the left spermatic artery.

October 25th: The animal is healthy. It weighs only 20 kilograms. The left testicle is harder than the right one.

October 26th (nineteenth day after tuberculization): We inject, in the left spermatic artery, 10 drops of a hydro-alcoholic solution of naphthol. In the following days the inflammatory reaction is intense; the testicle is very large and painful. The animal refuses to eat. But toward November 7th or 8th all the inflammatory phenomena give way again, the general condition gets better and becomes very satisfactory.

January 9th: The animal is killed; it weighs 25 kilograms. The left testicle has come to the volume of a bean. It is firm, sclerosed. One may find, by coloration with Ziehl, no bacilli in the nodules, with small round cells which are found in great number as vestiges of the infectious foci that must have been in the parenchyma. No tuberculosis anywhere else in the viscera. The injections of naphthol in the spermatic arteries have caused a beginning of sclerosis in the lumbar ganglia, corresponding with the injected testicle. So a part of naphthol has been carried away, we do not know under what form, by the lymphatic vessels.

The injection of naphthol has, in this case, stopped the generalization of tuberculosis, as well and in the same time as the ablation of the testicle.

8. Injections of Infected Cultures of Tuberculosis.

In the following observations we produced—unexpectedly—a gangrenous orchitic process, and peritoneal and general infections, complications which we think necessary to describe, for, if they show that the least failure in asepsis wholly changes the results of those intraspermatic injections, we think also that they allow to believe that the lesions obtained with a good technic are due to the injected media.

We notice also that those accidents happened in a series, during experiments made March 11th and 25th and April 1st. We think they were due to the infection of the very culture of tuberculosis we have used, and they happened no more when we ceased to use that culture.

Exp. XXVII.—Dog No. 21. Weight 20.4 kilograms.

March 25th: Injection in the right and left spermatic arteries of 1.5 c.c. of bouillon emulsion of tubercle bacilli of human origin.

March 28th: Both testicles are enlarged and painful.

March 29th: Death in the afternoon. On post-mortem examination generalized peritonitis. The left testicle is transformed into a putrid and sanguinolent pap. The right testicle is of a generalized red color, with large circular patches of yellowish color especially at the periphery. All the parenchyma is necrosed. At the utmost one may color, at the periphery, a small breadth of interstitial tissue, where numerous polynuclears may be found. Karyolysis is intense. In the peripheral zone some tubes remain, the necrosed epithelium of which is completely desquamated.

Exp. XXVIII.—Dog No. 22, weighing 17.3 kilograms.

April 1st: Injection in the right testicle of 1 c.c. by punctures; in the left spermatic artery 1.5 c.c. of bouillon emulsion of bacilli from human tuberculosis. The injection is performed with some difficulty and a certain amount of the liquid leaks along the vagino-peritoneal canal. In the night April 2d, the dog died. Autopsy on April 3d at 10 A. M. The right testicle with its multiple punctures is much enlarged, with multiple and extensive hemorrhages, scattered in the whole testicle. The epididymis is very red and large. No liquid in the tunica vaginalis testis.

The left testicle, which had been badly injected, is large and congested. A coagulum reaches the peritoneal opening of the vagino-peritoneal canal, and one may see an acute peritonitis having already agglutinated the distended and purple-looking intestinal loops. On microscopical examination one may see that the interstitial tissue is the seat of an edematous infiltration and an acute fibrino-leukocytic exudate. The cells scattered in the interstitial tissue are nearly wholly necrosed and take color but diffusely. In other places a certain number of polynuclears seem to be the last anatomical elements that persist (perhaps because they are formed the last), and one may see an acute karyolysis. Fine droplets, deeply colored by basic stains, represent vestiges of the nuclei.

The wall of the seminiferous tubes wrinkles around the tube. The wall itself seems nearly untouched, but the seminal epithelium is wholly necrosed. Spermatozoa alone take the stain deeply. All the epithelial cells come off. In some tubes the same thing happens for the nuclei of the spermatogenetic cells. For the polynuclears of the interstitial cells. There are a great number of small droplets, deeply colored, representing nuclei about to divide in the seminal epithelium. We found no trace of glycogen in either of the testicles.

Exp. XXIX.—Dog No. 23, weighing 7.8 kilograms.

March 11th: Injections in the right and left spermatic arteries of 1.5 c.c. of bouillon dilution of Koch's bacilli from human tuberculosis.

March 15th: Both testicles are swollen and painful. The left testicle is transformed into a sanguinolent pap. It bursts under the pressure of the fingers when taken away. On the periphery remains a layer or parenchyma immediately connected to the albuginea and of a yellowish tint. Examination shows long, voluminous bacilli, keeping color by Gram's method. The same bacillus is found in the putrid magma of the testicle. Some Koch's bacilli may be stained, but not easily, in the smears. The right testicle is somewhat congested and is firm on section. The testicle of this dog has been transferred to bouillon. A bacillus grew on it more thickset than in the smears, taking also the Gram, and dangerous, for it killed a guinea-pig on

the second day after an injection of 1 c.c. in the peritoneum. That guinea-pig presented an acute inflammatory reaction in the peritoneum and a diffuse edema in the subperitoneal and subcutaneous cellular tissue.

The study of this microbe has not been undertaken.*

9. Glycogenesis in Tuberculosis of the Testicle.

In a former study† we have shown that glycogen always exists in the normal cells of dog's and man's testicle, more particularly in the internal cells—that is, in the layers of spermatids and spermatocytes. It exists as fine granulations in the spermatic pap, but disappears from the sperm in the excretory canals. We have also shown the variations of this glycogenesis, according to some pathological states, such as the ligature of the spermatic cord, of the spermatic artery, of the deferent canal alone, etc.; or such as the infections of virulent microbes or active toxins, in the spermatic artery in the glandular parenchyma, or in the deferent canal, etc. We have studied the modifications of glycogenesis in tuberculosis of the testicle.

As we have already shown for the experimental tuberculosis of the dog's liver, the tubercle, consisting at the beginning of a more or less considerable amount of polynuclear white globules, is transformed, after three to five weeks, into an organized tubercle, consisting of mononuclear elements, of a lymphatic or connective-tissue origin (in all cases mesodermic).‡ Sometimes the granuloma appears sooner. To study the changes produced in glycogenesis of the testicle by tubercle bacilli, examinations must be made at longer intervals after the injection.

In the spermatic artery the massive injection of 10 or 20 drops of culture of tubercle bacilli, such as we have made in five cases, destroys in all cases the glycogen of the cells of the testicle. Injection of tuberculosis in the deferent canal, even after ligature of the canal, determines no extensive disappearance of glycogen after thirty-three days. By this process the bacilli do not diffuse uniformly. Puncture of the testicle with a syringeful of tuberculous culture does not destroy glycogen, except perhaps in a few places, probably in the track of the punctures. Lastly, in tuberculous animals whose testicle presented no evident injury, the glycogen of the testicle seems to have remained unaffected.

On the other hand, if one examines testicles of animals infected either by the spermatic artery or by the general circulation, or even by puncture of the gland, after forty or fifty days, that is, when testicular granulia or massive fibrous or caseous tuberculosis is evident, one may ascertain the

*These cases may be compared to Gosselin's ulcero-gangrenous orchitis.

† Loeper and Ch. Esmonet, "La glycogénèse du testicule," Bulletin Société anatomique, June, 1902.

‡ Loeper and Ch. Esmonet, "La glycogénèse des tubercules granuliques du foie et du testicule," Bulletin Société anatomique, February, 1902.

presence of glycogen in the cells that form the tubercle, and its disappearance in the tubes of the testicle compressed and injured by the tubercles; so much so that in case of a very extensive granulia, the few tubes that remain are completely deprived of glycogen. We have ascertained that in eleven cases.

In these cases the disappearance of glycogen from the testicle is proportional to the dose of microbes and to the invasion of the organ by the tubercle bacilli.

In man we have three times examined tuberculosis of the epididymis, with nearly complete integrity of the testicle, which was a little or very much glycogenated. In one case of tuberculous granulia of the testicle, consecutive to a tuberculosis of the epididymis, only a few tubes retained their glycogen, but nearly all the tubercles were glycogenated.

10. Fat in Tuberculosis of the Testicle.

The systematic examination of fat in a certain number of tuberculous testicles showed us that there were generally, besides normal regions (tubes, interstitial cells), some regions very much altered, where the tubes were the seat of a fatty obstruction, and seemed unable to evacuate the products of their secretion. One may see interstitial cells disappearing by the invasion of a tuberculous nodule, but in most cases the interstitial cell resists a long time, and one may find in the very nodule some cells retaining their fat with its normal characters. It is the same with the fat of the tubes.

Technic for Experimental Orchitis Through the Spermatic Artery.

Infection of the testicle may be experimentally produced by puncture of the testicle, injection in the deferent canal, or by the blood-vessels. Most of the experimental orchitis we have obtained, resulted from the injection of infectious agents or poisons in the spermatic artery.

We think it useful to point out the few precautions that enable one to operate easily.

Technic.—We choose a rather heavy dog, generally more than 25 kilograms, and the testicles of which appear well developed. We induce anesthesia by an injection in the ear vein of a solution of atropin and morphin. After having prepared the operation field, we incise the skin immediately above the place where by palpation we feel the cord mixed up with the epididymal bundle. The incision, parallel to the pubic symphysis, is consequently somewhat oblique toward the top and axis of the body, in relation to the cord entering the inguinal canal. The incision, 2 cm. long, respects the abdominal subcutaneous layer and avoids any ligature or torsion. The finger inserted into the wound very distinctly feels the cord. With a catch forceps and a bistoury, one makes an incision through an adipose layer about 1 cm. thick, and so one reaches the cord surrounded by its fibrous

sheath. One denudes the cord for about 1 cm., the fibrous tunic is pinched, and on the fold a slight scissors cut is made. This incision is enlarged, to establish better parallelism with the cutaneous incision. The cord, brought out this way, consists of two parts of unequal volume, joined by an easily extensible and tearable meso: first, a posterior bundle, with the deferent canal, 3 mm. in circumference and with an artery; second, an anterior bundle, much more voluminous, where one may see, under a thin serous tunic, the arterial and venous bundle.

The arterial branches are easily recognized by their smaller volume, their sharp red color, their windings, sometimes so close that it is hard to distinguish the peripheral from the central part of the artery. The veins, more voluminous, of a blue black color, sink, whenever the vascular bundle is squeezed, toward the testicle. The artery, on the contrary, remains full and pulsatile.

Generally, when the incision of the skin and of the fibrous tunic of the cord was higher, one fell upon a single spermatic artery that soon divided, leaving on its way nearly imperceptible arterioles, which must be spared to keep the operative field clean. Same precautions for the veins. Without these cautions the injection is difficult.

By drawing down the cord, one ordinarily sees the arterial trunk single or divided, but straight. It is seen distinctly enough through the thin serous tunic to allow the introduction of the needle of a syringe. We use Luër's syringe. We easily perceive the resistance and we avoid the strains that tear the artery and enlarge the hole in its wall. The needle, the thinnest possible, must have a long bevel; it must be very sharp and present no trace of rust. Irido-platinum needles, somewhat larger for an equal lumen, appeared to us inferior to steel needles carefully preserved.

We seize the anterior bundle of the cord with the left hand, we stretch it with the middle finger. The index finger is placed above the vascular bundle. By drawing nearer the two fingers one may stop the course of the venous blood, and a slight centripetal pressure of the cord, made with the right hand, leaves only the artery filled up. These maneuvers enable one to operate alone. One may use a very smooth clamp forceps, squeezing the vascular bundle toward the testicle. An assistant takes it away as soon as one begins the injection. One stops squeezing the vascular bundle as soon as the needle is in the artery and one begins the injection.

We perforate the artery as obliquely as possible, so as to reduce the parallelism between the small serous wound and the arterial wound.

As soon as the injection gets into it, the artery gets white. Very often, when the injection is slowly pushed, one may see the blood diluting the solution and sweeping past the point of the needle. During the injection one

must let the cord go as much as possible, so as not to stop the returning blood. When the injection is over, one slowly takes away the needle.

Sometimes (it seldom happens with the spermatic artery) the arterial wound loses but little or no blood. This blood may fuse along the artery and the veins, without going out of the serous tunic. More often the blood spouts out. Sometimes, with a drop of collodion, we have been able to shut the puncture, but only when the stream was small. Very often the blood goes on flowing and forms a clot in the vagino-peritoneal canal, sometimes filling the whole canal and even reaching the peritoneal cavity.

For a long time we shut the operative wound in a first (subcutaneous) plane only, and afterward by a second (cutaneous) plane. Little or no blood at all got in the vagino-peritoneal canal, but in return a hemorrhage of a variable abundance infiltrated the adjacent cellular tissue. As we thought we noticed that this hemorrhagic exudate stopped the cicatrization of the wound and might predispose to infection, we use now the following process: When we open the common fibrous tunic, we put at the upper end of the incision of this tunic a thread in form of a U, of very thin silk, and we leave the thread untied. The same at the inferior part of the incision. After the injection we tie the two threads. The tightening is slight and the cord is almost blood-tight. The operative wounds recover very quickly and the cord may be easily found when one wishes to do a second injection on the same artery.

We also made experimental injections of sterile bouillon, in doses of 1 and 2 c.c., as follows:

Exp. I.—Dog of 27.4 kilograms.

We performed an injection of 2 c.c. of sterilized bouillon in the left spermatic artery. On the right side the injection was missed and we tied the artery. The animal was killed twenty-four hours afterward. The left testicle presented a normal aspect; microscopical examination shows the entire soundness of the interstitial connective tissue and of the seminiparous epithelium in a state of evident activity.

On a level with the operative wound, extending 2 or 3 cm. into the vagino-peritoneal canal, is a coagulum of blood molded in the cord.

Exp. II.—Dog weighing 22.2 kilograms.

An injection of 1 c.c. of sterile bouillon in both spermatic arteries. The right testicle is taken away eight days afterward; the left one seventeen days afterward. Both are macroscopically and microscopically unaffected. Spermatogenesis is very active. A grayish mass, easily dissociated by the finger, remains along the cord on the right side, 3 or 4 cm. long. On the left side the cord is somewhat large and hard and intimately mixed up by its anterior part with the cellular tissue of the region. The circulation seems in no way hindered. Both testicles bleed when cut.

Exp. III.—Dog weighing 15 kilograms.

The injection made in the right spermatic artery (1 c.c.) showed an unaffected testicle ten days later.

The effects obtained by injection of infectious and toxic substances by this process seem to be due to the injected agents, and not to the vehicles.

Ligature of the Spermatic Artery.—Fearing that some results given by the injections in the spermatic artery may be considered as due to a passing or lasting obliteration of this artery, we have tried ligature of the spermatic artery, without any action on the testicle.

Exp. I.—Dog No. 38, weighing 18.4 kilograms.

October 1st: Ligature of the right spermatic artery. Testicle taken away after twenty-four hours. By microscopical examination very large hemorrhagic suffusions are found in all the interstitial tissue. The epithelium of the seminiparous tubes takes much color; the spermatogenetic stages are easily recognized and spermatozoa are numerous. But the union of the cells is about to disappear, and the regularly superposed strata begin to be mingled, foretelling the beginning of the seminal catarrh. No glycogen found.

Exp. II.—Dog No. 39, weighing 16.5 kilograms.

April 15th: Ligature of the left spermatic artery.

April 19th: Firm, large, and painful testicle. It is much vascularized, especially on its central part. The interstitial tissue presents abundant hemorrhages. The epithelium of the seminiparous tubes is desquamated. The ordinary strata of spermatogenesis are not distinct; the anatomical elements take color more diffusely, although they remain recognizable. No glycogen.

Exp. III.—Dog No. 37, weighing 8 kilograms.

July 14th: Ligature of both spermatic arteries.

July 17th: Ablation of the left testicle. This testicle is congested, very red. Same interstitial hemorrhages as in the preceding case. The shedding of epithelium in the tube is much more evident. The cells of the first layer, and a great part of the spermatocytes, remain joined to the wall. Nuclei and protoplasm color less darkly.

Glycogen has completely disappeared.

Fat gets out from the seminiparous cells, to localize in the center of the tubes. But especially one may find an adipose excess in all the interstitial, intertubular, subalbugineous, pericanalicular, lymphatic spaces. Sometimes fat gets out at the same time by the excretory canal, and by the interstitial tissue, by a phenomenon of resorption analogous to that one meets around the necrosed foci.

We have not been able to ascertain the stages following the loss of the epithelium and the abundant interstitial hemorrhages. We have studied the state of the testicle after some weeks or some months.

Dog No. 37, in which the right spermatic artery was tied, was examined on September 13th, two months after the ligature. The testicle was small, soft, and it had a normal appearance. It bled when cut. By microscopical examination it looked absolutely normal, with numerous spermatozoa. Glycogen in small quantity was found. The results obtained on dog No. 1 were quite similar.

Exp. IV.—Dog No. 1, weighing 12.2 kilograms.

July 17th: Ligature of both spermatic arteries.

September 11th: Both testicles are easily perceptible. Their consistency is less firm than normal.

September 13th: Ablation of the left testicle. It weighs 6.5 gr. Its aspect is normal. By microscopical examination one may ascertain spermatogenesis, with its normal evolution. Spermatozoa are numerous. In one of the tubes a very large cell is found with a crown of nuclei at the periphery. This cell is in the most superficial stratum of the epithelium and resembles the coalescent cellular forms found in seminal catarrh. A few grains of glycogen.

October 14th: Ablation of the right testicle. Weight 7.5 gm. Its aspect is normal, it contains numerous spermatozoa. Glycogen in great quantity.

It follows, from the comparison of the results obtained by the ligature of the spermatic artery with those obtained by injection of cultures or of poisons, that to the first belongs the extensive hemorrhagic effusions and the precocious shedding of the seminal epithelium.

After such a beginning quickly follows the reconstitution of the epithelium and the clearing of the interstitial tissue. Examination of the testicle made at different times, after two months, and from the ninth to the tenth week, after ligature of the spermatic artery, shows the *restitutio ad integrum* of the seminal epithelium, in which the spermatic function seems completely restored, and where one may even ascertain the presence of two indicators of the gland's sexual activity, the extra-tubular and intra-tubular fat, and the glycogen of the epithelium.

TUBERCULOSIS OF THE BREAST.*

By Wm. L. Rodman, M.D., LL.D.,

Professor of Surgery in the Medico-Chirurgical College; Surgeon to the Medico-Chirurgical, Presbyterian, Jewish, and Philadelphia General Hospitals.

Virchow did not include tuberculosis as one of the affections to which the mammary gland was liable. Although Sir Astley Cooper and Velpeau had discussed tuberculous diseases in a somewhat vague and indefinite way, it was not until 1881 that Dubar made a careful, systematic, and scientific classification of the disease. He was the first to demonstrate the tubercle bacillus in connection with the breast.

Though undoubtedly rare, tuberculosis of the mammary gland is more common than it has been previously thought to be. In fifteen hundred cases of mammary disease admitted to St. Bartholomew's Hospital, London, there were 1.5 per cent. due to tuberculosis.

Tuberculosis of the breast may be primary or secondary. It cannot be stated that the lesion is primary unless at autopsy a careful and systematic examination is made to exclude the possibility of a focus elsewhere. If no such focus be found, it is fair to assume that the disease is primary. When primary, infection may either take place through the blood or directly from without. When occurring in the latter way, infection may take place either through an open wound or through the galactophorous ducts. Verneuil believed strongly in the latter mode of infection. Inasmuch as the lesions are more pronounced in the alveoli than in the ducts, and, furthermore, as the ducts themselves are not more diseased at their exit at the nipple than in the substance of the gland, it is questionable whether infection through the duct is common. If infection occurred through the duct, it is reasonable to suppose that the lesion would be more pronounced at the beginning of such ducts than elsewhere. Kitt, who has made a thorough study of bovine tuberculosis, is of the opinion that tuberculosis of the udder is nearly always of hematogenous origin.

Secondary tuberculosis of the breast may result from the extension of the disease from the ribs or pleura, or be carried by the lymphatics from

* This article came to hand late. Its proper place is in the proceedings of Tuesday, September 29th, immediatly after the article of Prof. Sauerbruch.

diseased axillary or other neighboring lymphatic glands, or through the blood-current from a focus even remotely situated.

It has been fairly well established that the disease begins within the acini rather than in the connective tissue of the breast.

Etiology.—Mammary tuberculosis is far more often encountered in females than in males, and is particularly obnoxious to young women. Of thirty-two cases studied by Delbet, there were eighteen in the decennium from twenty-five to thirty-five. Schley was of the opinion that it occurred with equal frequency in the third, fourth, and fifth decades. Although more often found in young women, tuberculosis may be found at any time of life. One case I have encountered in literature in a woman of seventy.

Heredity exerts little, if any, influence. Trauma and inflammatory affections, by lowering the vitality of the breast, predispose it to subsequent tuberculosis. Tuberculosis in other parts of the body markedly predisposes one to secondary involvement of the breast. Mandry found tuberculosis elsewhere in one-half of the cases that he carefully investigated.

Pathology.—We shall not consider miliary tuberculosis, which is a general process, and therefore not confined to the breast. There are both discrete and confluent varieties. In the former there are isolated tubercles separated by healthy tissue. These tubercles may undergo changes, either remaining isolated, or by their coalescence forming larger masses, this constituting the confluent form of the disease. The isolated tubercles vary widely in size, some being smaller than a pea, others as large as a hazelnut. When caseation and liquefaction occur, abscesses result.

In the confluent variety a swelling of considerable proportions results. It is, however, not sharply limited, being ill-defined and irregular, with bosselations here and there. If cut into during the early stages, it is white or grayish in color and rather firm in consistency. Later on, however, the center will have become yellow in color, although the periphery may still retain the original appearance. When liquefaction occurs, the so-called cold abscess of Roux results.

Cases of tuberculosis of the breast coincident with carcinoma have been recorded. In one of four cases reported the symptoms of tuberculosis predominated and the macroscopical appearance was that of tuberculosis rather than carcinoma. Microscopical examination demonstrated carcinoma as well. I have seen one well-marked instance of such associated disease, a photograph of the lesion being shown in my book on diseases of the breast. Of two such cases reported by A. S. Warthin, of Ann Arbor, Michigan, tuberculosis was primary in one, and carcinoma undoubtedly the primary lesion in the other. Pilliet and Piatot reported another such case in a male aged fifty-one.

Rokitansky, who taught that tuberculosis and carcinoma never occur

simultaneously, afterward acknowledged his error, and admitted that the two diseases were infrequently associated. We cannot at the present time say whether or not the association is fortuitous, or whether one lesion predisposes to the other. It is not difficult to understand how the irritation produced by the tubercles might easily cause abnormal proliferation of epithelial cells ending in cancer.

Symptoms.—The onset of the disease is insidious, except when it occurs during lactation, when it is of more rapid growth. It may last for years. Only one breast is affected, there being no case, so far as I know, where both organs were involved.

In the discrete variety indurated areas may be detected here and there throughout the substance of the gland, but separated apparently from the surrounding tissue. In other cases the outline is indefinite.

The skin is not adherent until late in the disease. When it is, fistulæ soon form. Pain is a rare symptom early in the disease, and when present does not exist to a pronounced extent. It may be severe as a late symptom.

The confluent form pursues a more rapid course, fistulæ forming early in its evolution. A mass varying in size from a hazelnut to an orange, of irregular outline, hard or soft, is found usually in the upper and outer quadrant. The axillary glands are early involved, rapidly increase in size, and may suppurate. It is to be noted that the glands do not fuse and become matted together as in carcinoma. This is of importance as a differential sign.

Diagnosis.—The recognition of mammary tuberculosis may at times be far from easy, especially if the case presents itself before there is destruction of tissue. When fistulæ are present, together with enlarged axillary glands, there should be little difficulty in the diagnosis. Its recognition will be easier if there are known to be tuberculous foci elsewhere.

The disease may be confounded with actinomycosis, but the presence of the ray-fungus in the latter affection enables a positive diagnosis to be made. Tuberculosis has been mistaken for carcinoma and vice versa. In cancer the skin very early in the affection becomes adherent; whereas it is a late symptom, if it occurs at all, in tuberculosis. In cancer the axillary glands may enlarge slowly, are harder, and become fused together, which is not the case in tuberculosis. Tuberculous disease occurs in young women more generally. Carcinoma is usually found after forty.

Prognosis.—In primary tuberculosis the prognosis is excellent. In the secondary form it will depend, of course, upon the nature and extent of the primary lesion. Of sixteen patients reported by Braendle, of the Tubingen clinic, fifteen were cured by operation and were shown to be well one to nineteen years afterward. Three of these patients succumbed to phthisis subsequently. There was, however, no local recurrence.

Treatment.—Tuberculosis of the breast should be treated by excision of a wedge-shaped portion of the gland, curetting and cauterizing the sinuses, or by amputation of the breast, according to the extent and variety of the disease. Where the process seems to be discrete and localized in a definite portion of the breast, partial resection of the gland is a warrantable procedure. Where a large part of the breast is involved, however, nothing short of amputation is to be considered. If sinuses are not too numerous, they may be curetted and cauterized. In one of my cases, a girl of twenty-two, an excellent result followed plastic resection of a part of the breast. She was entirely cured with practically no resulting deformity. It is important, I think, that the mammary gland of young marriageable women should not be sacrificed needlessly. I consider it necessary that the axilla should be explored in all cases, and if enlarged glands are found, they should be removed. An excision along the lower border of the breast, after Warren's method, freely exposes both the entire breast and the axilla to view. The scar cannot be noticed subsequently.

In cases which refuse operation, or in others possibly as an adjuvant to it, Wright's bacterial vaccines should be used. I have had no experience with this treatment, but its value in other forms of local tuberculosis warrants its employment in tuberculosis of the breast.

Bier's treatment may also be given a fair trial. A hemispherical glass vessel, somewhat larger than the breast itself, in the dome of which there is a glass nipple attachment, is placed over the breast. A rubber tube is placed over the nipple and, a suction pump being attached, sufficient negative pressure is made to cause a decided hyperemia of the skin. This is kept up for five minutes, then removed for five minutes, after which it is reapplied. This is repeated for thirty to forty-five minutes. There is no reason why a combination of Wright's and Bier's treatments may not be employed, for in this way the opsonic index of the blood may be relatively increased.

Transactions

of the

Sixth International Congress on Tuberculosis.

WASHINGTON, SEPTEMBER 28 TO OCTOBER 5, 1908.

WITH AN ACCOUNT AND CATALOGUE OF THE TUBERCULOSIS EXHIBITION,

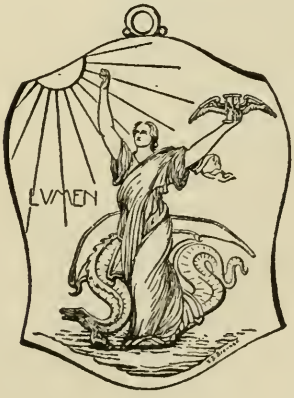
WASHINGTON, SEPTEMBER 21 TO OCTOBER 12, 1908.

In Six Volumes.

VOLUME TWO.

PROCEEDINGS OF SECTION IV,

Tuberculosis in Children—Etiology, Prevention, and Treatment.



Philadelphia:
WILLIAM F. FELL COMPANY
1908.

Officers of Section IV.

President:

Dr. Abraham Jacobi.

Honorary Presidents:

Dr. Karl Oscar Medin, Stockholm,
Prof. R. Lepine, Lyon,
M. Augustin Rey, Paris,
Dr. Clemens von Pirquet, Vienna,
Dr. Bertil Buhre, Stockholm,
Prof. Paul Nobecourt, Paris,
Dr. Carl Hart, Berlin,
Prof. G. Pannwitz, Berlin.
Dr. Edouard Rist, Paris.

Vice-Presidents:

Dr. Isaac A. Abt,
Dr. S. S. Adams,
Dr. Wm. D. Booker,
Dr. H. D. Chapin,
Dr. John M. Dodson,
Dr. R. G. Freeman,
Dr. F. Forchheimer,
Dr. J. P. C. Griffith,
Dr. S. McC. Hamill,
Dr. Alfred Hand,
Dr. L. Emmett Holt,
Dr. Francis B. Huber,
Dr. C. G. Jennings,
Dr. J. H. M. Knox,
Dr. Henry Koplik,
Dr. John H. Lowman,
Dr. H. M. McClanahan,
Dr. Charles W. Mitchell,
Dr. John L. Morse,
Dr. Wm. P. Northrup,
Dr. T. M. Rotch,
Dr. John Ruhräh,
Dr. A. H. Wentworth,
Dr. Martha Wollstein.

Secretaries:

Dr. David Bovaird, Jr.,
Dr. F. S. Churchill.

SECTION IV.

Tuberculosis in Children—Etiology, Prevention, and Treatment.

FIRST DAY.

Monday, September 28, 1908.

PRESIDENT'S ADDRESS. FAMILY HISTORY OF TUBERCULOUS INFANTS. THE VON PIRQUET REACTION. TUBERCULOUS LYMPHATIC GLANDS. THE RELATION OF ACUTE INFECTIONS TO TUBERCULOSIS. THE OPSONIC CONTENT OF BREAST-MILK.

The Section was called to order by the President, Dr. Abraham Jacobi, at half past two o'clock. Honorary Presidents of the Section were elected as follows:

Dr. Carl Oscar Medin, Stockholm.
Dr. Bertil Buhre, Stockholm.
Dr. R. Lépine, Lyons.
Dr. Paul Nobécourt, Paris.
M. Augustin Rey, Paris.
Dr. Carl Hart, Berlin.
Dr. Clemens von Pirquet, Vienna.
Dr. Gotthold Pannwitz, Berlin.
Dr. Edouard Rist, Paris.

Before taking up the formal program the President addressed the Section as follows:

PRESIDENT'S ADDRESS.

By Dr. Abraham Jacobi,
New York.

America has seen, during a few decades, many large and influential meetings, both national and international. They were dedicated to various interests, scientific and commemorative, warlike and peaceful. The grand exposition and congress of St. Louis, in 1904, combined in twenty sections whatever appeared to a thoughtful and energetic central committee to be

most appropriate in bringing together the best thought of the world. Then, as now, great men reached our shores over the ocean—which has become a connecting bridge, after having proved a severing gulf—to exhibit their own and others' achievements, and succeeded in furnishing a comprehensive and lifelike exhibit of the present conditions of science and art in their influence on the cultural labor of mankind. While in this way the intellectual and social interests of the world were displayed and fostered, the normal and destructive instincts of brute man were also studied and their dire results held up to view, in the peace congresses of this and other countries. Evidently mankind is more active than ever in the attempt to be rid of its savage past and to develop a humane future on the basis of the impulses of its heart and the dictates of its brain.

If there be any concourses of more merit and endowed with more beneficent influence in shaping the future of our race than even peace congresses, it is the series of congresses on hygiene and demography, and principally those on tuberculosis, which have met during the last two decades. Representatives of the medical professions and the intellectual lay public of all civilized nations convened with a sternly expressed demand that there must be an end to the hecatombs of victims of the cruelest enemy of our race, which cannot be combated except by an aggressive movement of the whole line. Altogether, the fight against infectious and contagious diseases is no longer a strictly medical matter. What our active practitioners and our laboratory experts could do they have accomplished. The nature of anthrax, of diphtheria, scarlet fever, and typhoid fever have been recognized and proclaimed, *urbi et orbi*, and preventives have been found and advised. If governments and their employees have in many cases, and not least in our country, neglected our warnings and active measures, we, the physicians, have mourned and our fellow-citizens have suffered. For, though we have the knowledge of the causes of typhoid fever at our fingers' ends, vigorous men, before they ever saw an enemy, have died in untold numbers in camps; and towns and country have been devastated by it, though it belongs to a class of easily prevented epidemics. Hundreds of endemics and epidemics of scarlet fever and diphtheria have followed the track of infected foods, and hundreds of thousands of promising infants and children are swept away annually by decomposed or infected milk. Tuberculosis has proved the deadliest and most obstinate enemy of them all. Its onset is insidious, its course frequently not suspected or watched; its invasion not prevented, on account of the neglect of mucous membranes; its development insured by depressed vitality; its curability ignored, and its fatal termination more feared than palliated.

This Fourth Section of this Congress, dedicated, as it is, to the etiology, prevention, and treatment of tuberculosis in children, does not discuss the

mooted question of whether pediatrics deserves a place among the specialties in medical practice. Your problems are more direct. Is the tuberculosis of infancy and children exactly like that of advanced years? What is its frequency? Are most cases of tuberculosis of the adult preformed in the child, as it has been claimed? Does tuberculosis depend on milk alone, or is it so in the majority of cases? Or has milk-feeding little or nothing to do with its origin? What is the difference between bovine and human tuberculosis? How is milk to be treated? Is it to be administered raw, pasteurized, scalded, sterilized, pure, or diluted, or mixed? What has the udder or the mamma to do with it? These and many other questions are placed before you in the syllabus I distributed a year ago. Besides, what is, after all—in connection with the question of vitality and power of resistance and of predisposition—what is infancy and childhood? Their boundary-lines vary with different points of view. The law of our land terminates childhood with the sixteenth year. Others look for puberty as the closing period. Our Thomas Rotch has taught us not to count years, but the development of the osseous system, in deciding the question of maturity or fitness for labor, and others are guided by the degree of the retardation or advancement in the evolution of other organs. This much is certain, that no whimsical legal decision will determine physiological or pathological questions, but alone medical knowledge and the physician, who should be consulted in every doubtful case.

The relation of the physician to the treatment of tuberculosis is twofold. As the medical adviser of the individual patient, he looks out for his comfort, advises him in regard to his diet and other hygiene, selects a sanatorium, counsels change of occupation, and utilizes other therapeutic measures. Time and again he may demonstrate that the administration of drugs is not obsolete or powerless. There are many symptoms to be relieved or removed, the power of vital resistance to be increased, the circulation to be strengthened, digestion stimulated, nutrition improved by hydropathy and by medication with arsenic, digitalis, guaiacol or bone-marrow. A great many mistakes are being made by relying on one-sided fashionable methods only, be they rational in themselves or only temporary fads. Rest and food, and air and change of air, are ever so many steps in the right direction. One, however, must not exclude the other, and the loud pronunciamentos against the materia medica are the results of prejudice and ignorance. It is true that the voices protesting against the assistance offered by the pharmacopeia are impetuous, aye, stentorian; but, two thousand years ago, our old friend Plutarch taught us that all hollow things are sonorous.

In this way many are saved. It is true that, while what we accomplish is frequently the restoration of perfect health, in too numerous cases life only, without health, is preserved. But the invalid has a right to life, and to

command our efforts to save and to invigorate him. It is not our fault when the average vigor of human society is undermined by the accumulation of numberless invalids kept alive. In such situations the subjects of our exertions are sick individuals who insist upon salvation from death, and demand that their lives be prolonged, though they be less than normally competent. In that way we still add to the human capital and to economic wealth, while other forces actually reduce and impair it. It is characteristic for misanthropic critics to blame us for preserving inferior individuals, but not to object to wholesale destruction of strong men. For the strenuous foolhardiness which still sees virtue and happiness in warlike enterprises forgets that by war the flower of the land's men, and not weaklings, are killed or rendered invalid or demoralized, and that the lower stratum of vigor remains behind to live and to multiply and to transmit their own diseases or physical inferiority or predispositions. No infectious disease ever left the people in as low a physical, moral, and economic condition as does a war of equal duration or ferocity.

At best the recovery of the tuberculous individual is difficult, and too often doubtful. In common life it is the family physician who knows the physical traits of his wards and is in a position to employ the means of prevention at his disposal. The time should come very soon when the specialistic fad, which has invaded and controls the public even more than our profession, will make way for the renewed recognition of the family physician as the truest friend and the most meritorious adviser. Too often, when the tuberculosis specialist is consulted, the preventive and curative measures of the family practitioner, who was not consulted, are no longer within reach. What the latter is doing for the individual or for the family, medical science and the profession at large have been and are doing for the sanitary conditions of the public at large and the community, through well-directed literature, through boards of health, and through legislation. This very Congress has reserved a whole section to the consideration of State and municipal control of tuberculosis, and of laws and ordinances relating to it. The time is approaching when the people will insist upon having health safeguarded by the public recognition of its claims. We have in this country a cabinet with special members for law, for war, for the navy, for foreign politics, for internal political and economic improvements. We have a special department for agriculture, which supplies the people with rare and common seeds, and prevents and cures the diseases of their cattle. We even begin to make an end to our dereliction in allowing our forests to be burned or stolen. We have, however, no central representation of the forces that make for the physical welfare of the people, and no United States board of health in the advisory cabinet of the first employee of the nation. That is why the people, in their democratic and self-determining methods, are gathering

in societies, attempting and attaining what in many other countries it takes the powers of the governments to accomplish. That is why a congress like this invites the public at large, and the national and foreign governments, to share the labors and responsibilities of the medical professions of the world. Nothing proves to better advantage the interdependence of the several parts of the social organism, or the absolute impossibility of one man, or one class of men, passing a hermit life and still prove useful. The individual physician deteriorates when in solitude. His very studies, his work, require friction and coöperation and mutual instruction. The intercourse with his peers corrects his ignorance, which, as the sick around him have to suffer from it more than he, is sinful. No progress is ever evolved from castes, classes, or ruts. That is why the wondrous civilization of Asia came to a standstill at an early period. No single isolated source of instruction is prolific. That is why medicine cannot be learned from mere books, any more than chemistry or politics. Indeed, in hermit life there is such a thing as a primeval forest of ignorance and helplessness, inextricable and aimless.

That is why so much can be accomplished by coöperation with the public at large, according to such methods as this Congress contemplates and provides. Indeed, medicine must become a popular science; not the cheap medicine of the sensational penny-a-liner, but the fertilizing knowledge of basic truths in physiology and applied hygiene. In this new century universal ignorance of any people or any race, even the white race, should be esteemed an intolerable scandal, as it surely leads to poverty and anarchy. Do not tell me that it has been said that half knowledge is the most detrimental thing. It is not half knowledge that engenders superstition, and lynching, and sectarianism, and faith cures—they originate from the same depth of darkness—it is total ignorance. As long as medical science will not enlighten the masses with its fundamental principles, it has failed in its most vital vocation. The simple facts of medicine should be taught in intelligible language in schools, from platforms, the pulpits, and last, by no means least, in newspapers. I know of none of the latter which has followed the advice I gave a few of them a score of years ago, and since, namely, to give the first and best-paid place on their editorial staff to an all-round medical man, with no duty in life except to teach the millions of readers the axioms of physiology and hygiene, and their application to practical every-day life; and no longer to rely on the haphazard opinions expressed in interviews by medical men who are given no time to think, or who are waiting for an opportunity to advertise themselves.

The unity of science has been preached this half century. There must be unity of science and the nation's practice. Men and women must learn that hygiene is no cure, nor is mere disinfection; that it means prevention,

prevention in the life of the individual, the town, the nation, mankind. We trust it may lead to a realization of the fact that a permanent health of the people at large cannot be fully attained except by fundamental social and political alterations. As these are far distant, the changes we should wish to enforce cannot be otherwise than gradual. Now, our successes in exterminating tuberculosis, though they have been marked, have been slow. In order to succeed fully, our work must be both individual and collective. Still, neither you nor I may live to see complete consummation. It may be, however, that some of you have read the epitaph on Charles Wesley's tomb in Westminster: "God buries his workmen but continues his work." Thus as there were workmen in our field before you and me, let us prepare the soil still better for those who will come after us, and still diminish the distance between the ideal and its realization. We doctors shall not find that very difficult, when we remember that our father Hippocrates identified the love of mankind with the love of our vocation. Both will aid us in assisting the advent of that era of therapy which is dawning, and promises cures and preventions in physical, political, and social conditions, and to help us become active citizens, both of the present and of the inevitable happier future.

TUBERCULOSIS IN INFANTS:

AN ANALYSIS OF 131 HOSPITAL CASES AS REGARDS FAMILY HISTORY AND PHYSICAL SIGNS, WITH REMARKS UPON PREVENTION AND TREATMENT.

By Linnæus Edford La Fétra, M.D.,
New York.

The material comprises 73 cases of proved pulmonary tuberculosis and 58 cases of proved meningeal tuberculosis. The cases were observed by the different attending physicians at the Babies' Hospital, New York city, between October 1, 1905, and July 15, 1908, and the records have been used since by the courtesy of Dr. L. Emmett Holt, the senior attending physician. Credit is due also to Dr. Josephine Hemenway, the resident physician, and Dr. Martha Wollstein, the pathologist, for their care and diligence in the bacteriological study of the cases.

The majority of the patients were under twelve months of age and none over three years. The youngest pulmonary case was two and one-half months; the youngest meningeal case was four months old.

The pulmonary cases, 73 in number, represented 2½ per cent. of the 2825 cases admitted during the period. They were proved to be tuberculosis by finding tubercle bacilli in the sputum in 53 cases, in the pus aspirated from the lung in one case, by necropsy alone in 11 cases, and by both necropsy and bacilli in the sputum in 8 cases. It is noteworthy that bacilli were obtained in the sputum examinations of the infants in so large a proportion of the cases, namely, over 70 per cent. The sputum is obtained either by passing a catheter into the esophagus, or by tickling the epiglottis with a piece of dry gauze, held in a curved clamp.

The meningeal cases, 58 in number, represented nearly 2½ per cent. of the 2447 patients admitted during the period. They were proved tuberculous by tubercle bacilli being found in the spinal fluid in 52 cases, by necropsy alone in 1 case, and by both necropsy and bacilli in the spinal fluid in 5 cases. In only one case were no bacilli found in the lumbar puncture fluid. In this case at necropsy the brain showed miliary tuberculosis.

TABLE I.—TUBERCULOSIS IN INFANTS

(Babies' Hospital, New York City).

73 Cases of Pulmonary Tuberculosis	
proved by tubercle bacilli in sputum	61 cases
proved by (necropsy also in 8).	
proved by bacilli in aspirated pus	1 case
proved by necropsy alone	11 cases
	73 cases
58 Cases of Meningitis Tuberculosa	
proved by bacilli in spinal fluid	57 cases
proved by (necropsy also in 5).	
proved by necropsy alone	1 case
	58 cases

In connection with the hunt for tubercle bacilli in the spinal fluid search was made for bacilli in the sputum of all but one of these meningeal cases. The results are very striking, for tubercle bacilli were found in the sputum of 33 of the 57 cases. In 8 of these meningeal cases bacilli were found in the sputum when there were no symptoms or physical signs of any chest involvement. There were evidences of pulmonary trouble in 28 cases—bronchitis 20 times and consolidation 8 times. To these must be added the 8 cases of bacilli in the sputum, making altogether 26 out of the 58 meningeal tuberculosis patients that had pulmonary invasion.

TABLE II.—TUBERCULOSIS IN INFANTS

(Babies' Hospital, New York City).

In 58 Cases of Meningeal Tuberculosis the lungs	
Were affected in	36 cases
No physical signs in	8 "
Signs of bronchitis in	20 "
Signs of consolidation in	8 "
Tubercle bacilli in sputum	33 "
Tubercle bacilli in sputum without physical signs in chest	8 "

Etiology; Family History.—As regards etiology, the mother, father, or some one else in close contact with the patient was found to have suffered from tuberculosis—almost invariably pulmonary—in over 40 per cent. of the meningeal cases. The exact figures are as follows: Among the 73 pulmonary cases there was tuberculosis, generally of the lungs, in the families as follows: father, 12 times; mother, 13 times; uncle or aunt, 2; other relatives, 2; nurse or friend, 2; tuberculosis in the room, 1;—a total of 32 times in 73 families, or over 40 per cent.

Among the meningeal cases there was open tuberculosis in the families as follows: father, 11 times; mother, 2; uncle or aunt, 2; other relative, 3; nurse or friend, 3;—a total of 21 times in 58 families, or nearly 40 per cent. The father was the source of infection more frequently than one would have

expected, namely, in 23 of the 53 cases in which the probable source could be traced. Of particular importance, because avoidable, are those cases in which an invalid friend, male or female, was permitted (having nothing more important to do) to take care of the baby or carry it outdoors for an airing while the mother attended to her housework, and those cases in which such persons borrowed the baby to play with, and those in which the family harbored a boarder with a chronic cough.

TABLE III.—TUBERCULOSIS IN YOUNG INFANTS—FAMILY HISTORY.

Tuberculosis in:	73 Pulmonary.	58 Meningeal.	Total, 131
Father	12	11	23
Mother	13	2	15
Uncle or Aunt	2	2	4
Other Relative	2	3	5
Friend or Nurse	2	3	5
Room infected	1	—	1
Totals	32	21	53
Percentage	43.8	36.2	40.4

It was impossible to investigate the cow's milk used by those artificially fed; but it is significant that there were only two cases of peritoneal tuberculosis, and no case of tuberculous enteritis, in the series. Moreover, the tenement population of New York almost invariably boils the milk as soon as it reaches the home.

Diagnosis; Physical Signs.—The diagnosis of tuberculosis of the lungs in these infants by physical examination of the chest is impossible in a large proportion of the cases. Some give no signs at all, many present simply the generalized râles of an ordinary bronchitis, while others give signs of lobar or bronchopneumonia; only a few present evidences of cavity or of consolidation with adhesions. When consolidation is present, its location is not characteristic. Taking the 73 pulmonary cases and adding to them the 36 cases of meningeal tuberculosis in which the lungs were involved, there was a total of 109 cases. The subjoined table shows the findings:

TABLE IV.—PHYSICAL EXAMINATION OF THE CHEST.

109 Cases of Tuberculosis of Lungs—73 of pulmonary proper, and 36 of meningeal tuberculosis in which lungs also affected:	
No physical signs	11 cases
Signs of general bronchitis	46 "
Signs of bronchopneumonia or of consolidation and bronchitis	15 "
Signs of consolidation	56 "
Signs of cavity	5 "
Total	133 cases
Counted twice	24 "
	109 cases

The location of the consolidation or the cavity was anywhere from the apex to the lower lobe in either lung. Involvement of the right lung, however, and especially its upper and middle lobe, was twice as frequent as of the left lung; thus there were 35 cases in which the right lung was affected to 18 of the left lung. When present, localized signs in the nipple region of either lung, especially the right, are very suspicious of tuberculosis. It is to be emphasized, however, that there were 57 of these 109 cases in which there were either no signs at all or only those of general bronchitis.

TABLE V.—LOCATION OF CONSOLIDATION IN FIFTY CASES.

Right Chest.		Left Chest.	Total
5	Apex	3	8
4	Upper Lobe	5	9
9 (plus 6)	Middle Lobe	—	—
13	Lower Lobe	7	20
7	More than one Lobe	6	13
—		—	—
38	Total	21	59
	Counted twice		9
			—
			50

Location of Cavity (Five Cases).

Right Chest.		Left Chest.	Total.
2	Apex	—	—
—	Upper Lobe	1	—
1	Lower Lobe	1	—
—		—	—
3		2	5

This demonstrates the inadequacy of the chest examination by percussion and auscultation, and shows the need of the *x*-ray examination and of the newer tuberculin tests. Dr. Holt will, in the paper he presents, give the results of the ophthalmic and skin reactions made in the Babies' Hospital.

For an absolutely positive diagnosis of pulmonary tuberculosis in an infant suffering from a persistent hacking cough,—whether poorly nourished or not,—one must either find the bacilli in the sputum or see the lesion at necropsy; but the new tuberculin reactions of von Pirquet, of Calmette and Moro, when positive in these young subjects, are almost as reliable. For the negative side more can be said. If no bacilli can be found in the sputum after repeated careful search, and if the skin test is also negative, one can feel safe in excluding tuberculosis of the lungs, no matter what the signs in the chest may be. I have repeatedly observed consolidations in older children and localized râles in younger ones, which later have cleared up rapidly and entirely. From the physical signs alone any one would have asserted that they were tuberculous.

For a positive diagnosis of meningeal tuberculosis the bacilli should be found in the spinal fluid or the tubercles seen on the meninges at necropsy. The newer skin tests are of no value except in the last stages of the disease.

Results; Prognosis.—The 58 meningeal cases all died in the hospital. Of the 73 pulmonary cases, 31 died in the hospital, 26 were discharged unimproved, one was cured, and the remaining 15 improved. It is known that there were at least two deaths among those discharged, and that of the remaining 39, three are apparently well and a fourth is recovering in a sanatorium for tuberculosis. This was a patient ten months old at the time the tuberculous bronchitis was discovered; he is now two years old.

The others that recovered entirely are as follows:

A two-year-old—two years after discharge he seems well.

An eighteen-months-old—eighteen months after discharge he seems well.

A twelve-months-old Chinese baby—he had consolidation at the right lower lobe and general bronchitis with abundant tubercle bacilli. One year after discharge he was "recovering in a Chinese tenement-house."

Among the patients treated in the hospital at the same time, and without much doubt belonging in the same class of pulmonary tuberculosis,—though this was not proved by finding bacilli in the sputum,—were 6 other cases. This was before the time of the newer skin tuberculin reactions; but one gave a positive injection reaction. In 5 of their families tuberculosis was present. Of these 6 cases, 3 patients died soon after leaving the hospital and 3 recovered completely. The important point is that tuberculosis of the lungs in infants, though a very dangerous affection, is not to be regarded as hopeless, even when the patients live in an unfavorable environment. The recovery of these 4 cases of proved and 3 cases of most probable tuberculosis of the lungs is a strong argument for segregation and active treatment.

Had isolation from the known source of infection been practised in these cases, the series would have been reduced from 131 to 94—a reduction of morbidity and mortality of over 33 per cent. In prophylaxis it would certainly seem desirable that tuberculous persons should not have children—perhaps that they should not marry. Before the birth of a child the father and mother should be warned that tuberculosis is conveyed directly to the offspring by close contact, such as fondling, kissing, and especially by nursing a tuberculous mother. In addition to all the usual hygienic measures, isolation from the afflicted person should be maintained as fully as possible. The baby should not be allowed to creep on the floors, and these should be covered only by washable rugs. Milk from untested cattle should be sterilized and the diet carefully adapted to the baby's needs.

All children of tuberculous families should be periodically examined, not only for physical signs, but also for the reaction to tuberculin by either the skin or the eye tests. Suspicious subjects should at once be sent to a woods school or country sanatorium, or if the patient cannot go away, the fresh-air treatment should be undertaken at home by window tents, roof sleeping, etc.

Persistent coughs in infants should be vigorously treated lest the lungs become hopelessly infected or tuberculous meningitis supervene.

Tuberculosis en los Niños, un Analisis de 130 Casos en el Hospital con Relación a la Etiología, y el Diagnóstico, la Prevención y el Tratamiento.—(La Fétra.)

Los pacientes fueron menores de tres años de edad y la mayor parte menores de un año de edad. La madre, el padre ó algun otro en contacto íntimo con el paciente se sabe haber padecido de tuberculosis, casi invariable la infección fue pulmonar, 50 por ciento, y en mas de una tercera parte de los casos tuberculosis de las meninges. Entre los casos de tuberculosis de las meninges mas de la mitad han tenido tuberculosis pulmonar.

En la mayor parte de los casos de afección pulmonar, es casi imposible hacer el diagnóstico de la tuberculosis por medio del examen del pecho. Algunos casos no presentan signos, en otros los sintomas son generalizados, mientras que otros presentan signos de bronco-neumonía ó de neumonía lobular; muy pocos presentan signos caracteristicos tales como consolidacion con adhesión ó de cavidad. La localización de la consolidación no es característica. Para un diagnóstico positivo uno debe de encontrar el bacilo en el esputo ó ver el caracter de las lesiones. Una reacción cutanea en estas personas jóvenes es sinembargo la mas cierta. Si el examen del esputo y la reacción cutanea son negativos, uno puede menospreciar los síntomas del pecho y eliminar la tuberculosis en el diagnóstico. De los 73 casos de tuberculosis pulmonar, 34 fallecieron, 29 no mostraron mejoria alguna y 10 mejoraron. Cuatro pacientes, según parece, se aliviaron completamente, en estos no se encontraron los síntomas de los pulmones después de uno ó dos años de haber dejado el hospital.

Profilacticamente, el padre y la madre, en una familia tuberculosa, antes del nacimiento del niño, deben ser instruidos sobre el peligro de la infección del niño por medio de la leche de la madre y los besos. Aislamiento del las personas afectadas en tanto como sea posible, prevenir al niño de gatear en el suelo, prohibir el uso de alfombras que no se puedan lavar, esto y otras medidas higiencias deben ser obligatorias. Esterilización de la leche. Los niños de padres tuberculosos deben ser examinados, en cuanto a la reacción cutanea, perodicamente. Casos sospechosos deben ponerse bajo un tratamiento activo, si posible en casas ó escuelas de campo. La tos persistente en los niños debe ser tratada activamente para evitar la meningitis tuberculosa.

TUBERCULOSIS IN CHILDREN,

PARTICULARLY WITH REFERENCE TO TUBERCULOSIS OF LYMPHATIC GLANDS, AND ITS IMPORTANCE IN THE INVASION AND DISSEMINATION OF THE DISEASE.

By Theodore Shennan, M.D.,
Edinburgh.

The tables presented in this paper epitomize the results of an investigation of the post-mortem records of the Royal Edinburgh Hospital for Sick Children, in the case of children dying from tuberculosis while in-patients of that hospital.

The period covered by the records dates from February, 1883, to April, 1904, a little over twenty-one years. The successive pathologists responsible for the conduct of the examinations during that time were Sims Woodhead, Alexander Bruce, David Welsh, myself, and Stuart McDonald, so that it may be granted that the operations were skilfully performed and the important facts duly appreciated and accurately recorded.

The records for the sixteen years up to 1899 formed the basis of a previous statistical paper by myself, dealing with the channels of infection in tuberculosis, and the probable ratio obtaining between infection by the alimentary and by the respiratory systems. This appeared in the Edinburgh Hospital Reports for 1900. In 1904 I reinvestigated them, adding the cases which had come to post-mortem examination during the intervening five years. I studied them, for the third time, with care, in 1907, and presented a paper, based upon them, at the Congress of the Royal Institute of Public Health, held at Douglas, Isle of Man, in July of that year. During the present summer (1908) I have again revised the whole series of cases, even more minutely than before, and in still greater detail. The present paper is thus the product of an investigation, conducted four times, at long intervals, the frequent revisals tending to greater accuracy in the final results.

During the twenty-one years a total of 1085 post-mortem examinations were conducted; and of them, 421, or 38.8 per cent., were upon children who had died from tuberculosis. The records of 413 cases were sufficiently full for analysis, and with these this paper is concerned.

Infants under one year of age were not admitted to the Hospital until toward the close of 1888, so that the cases fall naturally into two groups or

series, the first including all cases up to the end of 1888, and the second including those occurring in the years 1889–1904.

In the former period 250 post-mortems were conducted, of which 105 were upon cases of tuberculosis; in the latter 308 cases of tuberculosis were met among 835 cases of all kinds investigated in the post-mortem room. Incidentally it may be noted that the second group, even though it contain a larger percentage of young children in the first two years of life, represents a fall of 6 per cent. in the number of deaths from tuberculosis, relatively to the total number of deaths from all causes.

One must bear in mind that these are post-mortem statistics, and while it is perfectly legitimate to employ them in drawing certain general conclusions, they must not be taken as even indicating, with any approach to accuracy, the conditions prevailing during life, but they show clearly the great importance of the lymphatic glands in the invasion and dissemination of tuberculosis. It is from this aspect principally that I shall view the subject of tuberculosis on this occasion.

Ages of the Cases.

The accompanying chart is plotted to show the percentages of the cases which died at the various ages up to thirteen years. The ages were available in 363 cases. Out of that number, 247, or 68 per cent., were under five years of age, and 116, or 31.9 per cent., were over that age. One hundred and ninety-six, or 54 per cent., died during the first three years of life, and only two out of the whole number were over twelve years of age. The highest mortality occurred in the second year of life in both series. Following this, the chart shows a rapid decline to the fourth year in the first series, and to the fifth year in the second series, succeeded by a transient rise in the fifth year in the first, and in the sixth year in the second series. If the totals at each age are combined and percentages taken, as indicated by the crosses on the chart, a single wave, having its maximum in the sixth year, replaces these two secondary rises, and thereafter, in the second half of the period of thirteen years, the death-rate steadily falls, except for a slight rise in the eighth year.

The first tables show the number of cases out of the whole 413 in which the lymphatic glands were tuberculous to the naked eye. Doubtless the percentages would have been considerably increased had the glands in every case been examined microscopically.

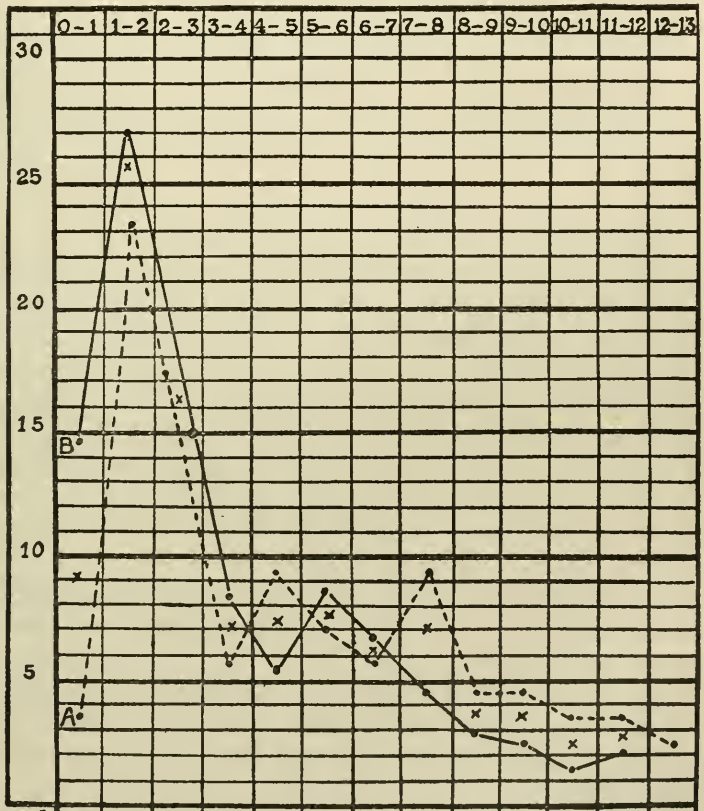
Pathologists are well aware that early proliferative changes, characteristic of the tuberculous process, with demonstrable tubercle bacilli, often to be found only after a prolonged search, can be detected in apparently non-tuberculous glands in tuberculous children, as well as in children to all appearance free from such infection. Moreover, it is also accepted as proved

that tubercle bacilli frequently lie "latent" in lymphatic glands in tuberculous or healthy children, without inducing any proliferative changes and only detectable by the tuberculosis produced in experimental animals by inoculation of the glands. One of the best summaries of the work carried out on these lines, by numerous observers, is given by Rabinowitsch.* She points out that in feeding experiments latent bacilli are more often found in the mesenteric glands than in the thoracic.

CHART TO SHOW AGES OF 363 CHILDREN, IN PERCENTAGES OF THE NUMBERS OCCURRING IN EACH YEAR OF LIFE.

A, First Series. B, Second Series.

Ordinate gives percentages; abscissa gives ages.



		0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13
NUMBER	A	3	20	15	5	8	6	5	8	4	4	3	3	2
	B	41	75	42	23	15	24	19	13	8	7	4	6	
PERCENTAGE	A	3.5	23.2	17.4	5.7	9.3	7.0	5.7	9.3	4.6	4.6	3.5	3.5	2.3
	B	14.8	27.0	15.0	8.3	5.4	8.6	6.8	4.6	2.9	2.5	1.4	2.1	

* Berl. klin. Wochenschr., 1907, S. 35.

FIRST SERIES.—TABLE I.

Lymphatic Glands.

Tuberculous in 97 out of 105 Cases (92.4 per cent.).

Mediastinal glands affected in	87 (82.8 per cent.)
Abdominal glands affected in	71 (67.6 per cent.)
Mediastinal and abdominal together in	61 (58.1 per cent.)
Mediastinal alone in	26 (24.7 per cent.)
Abdominal alone in	10 (9.5 per cent.)
	97

SECOND SERIES.—TABLE I.

Lymphatic Glands.

Tuberculous in 243 out of 308 Cases (78.8 per cent.).

Mediastinal glands affected in	194 (62.9 per cent.)
Abdominal glands affected in	150 (48.7 per cent.)
Mediastinal and abdominal together in	101 (32.1 per cent.)
Mediastinal alone in	93 (30.2 per cent.)
Abdominal alone in	45 (14.6 per cent.)
Thorax not examined in	4 (1.3 per cent.)
	243 (78.2 per cent.)

The first table, in my first series, shows that in only eight cases out of a total of 105 were the lymphatic glands to all appearance unaffected. In the great majority of the cases in which the glands were affected both mediastinal and abdominal glands were attacked. In the remaining cases, in which the disease was localized to one or the other of these groups of glands, the thoracic were affected twice as often as the abdominal.

In the second series, while in a large percentage of cases—nearly half—both thoracic and abdominal glands were simultaneously affected, the larger number showed the disease localized to one or other of these groups, and of these the thoracic glands were affected alone in twice as many cases as the abdominal, just as in the former series.

The subsequent tables show that from the standpoint of dissemination of tuberculosis throughout the body, the thoracic gland tuberculosis is the more important and common.

The second tables deal with visible tuberculosis of the mediastinal glands, including root, bronchial and tracheal, anterior and posterior mediastinal glands, particularly the first two groups, and show its relationship to tuberculosis of the lungs.

It will be at once noticed that, in a comparatively small proportion of the cases, older lesions, to which the glandular condition was probably secondary, were present in the lungs; whereas in the majority of cases more recent pulmonary tuberculosis, designated as "tuberculous bronchopneumonia," "rapid caseation," "caseous pneumonia," "miliary tuberculosis,"

etc., was present. These lung conditions were certainly, in many cases at least, secondary to the disease of the glands. This bears out the accepted opinion that in very young children—and the majority of those examined were under five years of age—it is the exception to meet with primary tuberculosis of the lungs.

FIRST SERIES.—TABLE II.

Tuberculosis of the Mediastinal Glands (87 cases).

Associated with pulmonary excavation	35	Cavities old 14; Cavities recent 19; Both varieties 2
Associated with tuberculous bronchopneumonia or caseous areas only	25	Tuberculous bronchopneumonia 17; Caseous areas 5; Both conditions together 3
Associated with miliary tubercles only, in the lungs	8	
With early caseation and miliary tuberculosis in lungs	2	
With tuberculous bronchopneumonia, and miliary tuberculosis	4	
With ulceration into bronchus—naked eye	2	
Without evident tuberculosis of lungs	11	
	87	

SECOND SERIES.—TABLE II.

Tuberculosis of the Mediastinal Glands (194 cases).

Associated with pulmonary excavation	53	Cavities old 19; Cavities recent 25; Both varieties 9
Associated with tuberculous bronchopneumonia or caseous areas only (no excavation)	42	Tuberculous bronchopneumonia 19; Caseous areas 18; Both conditions 5
Associated with miliary tuberculosis, only, in lungs	57	In 28 of these, localized spread from glands or pleura.
With caseous areas and miliary tuberculosis in lungs	10	
With tuberculous bronchopneumonia and miliary tuberculosis in lungs	8	
With old interstitial tuberculosis	1	
Apparently secondary to tuberculosis of the thymus gland	1	
Without evident tuberculosis of the lungs	22	
Total	194	

It is also interesting to note that in 11 cases out of 87 in the first series, and in 22 cases out of 194 in the second series, there was no evident lesion, either primary or secondary, in the lungs.

Table III in each series analyzes the cases in which the abdominal glands were visibly tuberculous, and gives valuable indications of the relationship of tabes mesenterica to tuberculosis of the lungs on the one side, and to ulceration of the intestine on the other.

FIRST SERIES—TABLE III.

Tuberculosis of Abdominal Glands (71 cases).

Glands caseous, accompanying intestinal ulceration.....38
- Old excavation of lung..... 9
- Recent excavation, evidently primary..... 7
- Recent excavation, relation to intestinal ulceration doubtful..... 1
- Ulceration primary.....16
- Ulceration more recent than caseation of gland; no excavation of lung..... 4
- Thorax not examined..... 1

Caseation of glands without any intestinal ulceration.....33
- Old excavation of lung..... 3
- Recent excavation of lung..... 6
- No excavation of lungs.....24

Excavation of lungs, without ulceration of intestine.....15 — Out of 34 cases showing excavation of the lungs.

In 8 of the 15 tabes mesenterica was present, in 7 being evidently secondary to the excavation.

SECOND SERIES.—TABLE III.

Tuberculosis of Abdominal Glands (150 cases).

Glands caseous, accompanying intestinal ulceration.....78
- Old excavation of lung.....13
- Recent excavation, evidently primary..... 9
- Recent excavation, probably secondary..... 4
- Ulceration of larynx, bad family history..... 1
- Ulceration and matting of intestine.....12
- Perforating ulcers and matting of intestine..... 6
- Ulcers evidently primary, no matting, no lung tubercle, or only miliary tubercle or early tuberculous bronchopneumonia.....11
- Early ulceration; glands in thorax and abdomen advanced caseation; no excavation of lung; occasionally miliary tubercles; possible double infection.....19
- Doubtful origin..... 3

Glands caseous, no accompanying intestinal ulceration.....72
- Excavation of lungs.....17
- Old fibro-caseous nodules in lungs..... 6
- No excavation of lungs.....49

Excavation of lungs, without ulceration of intestine.....27 — Out of 72 cases with excavation.

In 14 of the 27 tabes mesenterica was present, in 13 being evidently secondary

It shows that in nearly half of the cases, in which the abdominal glands were tuberculous, there was no ulceration of the intestine, and, moreover, that in a large number of these cases there was no excavation of the lungs—24 in the first series and 49 in the second series.

If one now examines all the cases, in the whole 413 cases under review, in which excavation of the lungs had occurred,—106 in all,—it is found that 42 presented no sign of ulceration of the intestine, but in 22 of these the abdominal glands were caseous, in 20 of them this condition being evidently secondary to the lung excavation—7 in the first series and 13 in the second.

The tables also give support to the opinion that multiple infection may take place, for example, in cases in which, without excavation of the lungs, ulceration of the intestine may exist of later date than the tuberculosis of the abdominal glands.

FIRST SERIES.—TABLE IV.

Ulceration of Intestine without Excavation of Lungs (26 cases, 24.8 per cent.).

Old caseous nodules in lungs 3
Tuberculous bronchopneumonia or rapid caseation in lungs 14
Miliary tubercles in lungs 5
Apparently no tuberculosis in lung 6
Abdominal glands affected in 20
Mediastinal glands affected in 21
- With tuberculous bronchopneumonia or rapid caseation 13
- With miliary tubercles in lungs 3

Abdominal and mediastinal affected together 17
(Therefore, abdominal alone in 3 cases, and mediastinal alone in 4 cases.)
Associated with tuberculous meningitis in 11 cases.

SECOND SERIES.—TABLE IV.

Ulceration of Intestine without Excavation of Lungs (60 cases, 19.4 per cent.).

Tuberculous bronchopneumonia 1
Miliary tuberculosis; perforated intestinal ulcer. 1
Caseous abdominal glands 26
- Active caseation in lungs 6
- Miliary tubercles in lungs 10
- Old caseous nodule in lungs ... 3
- No evident tubercle in lungs ... 7

Caseous mediastinal glands 1
- Acute tuberculosis in lungs 1

Caseous abdominal and mediastinal glands 31
- Active caseation in lungs 14
- Miliary tuberculosis in lungs ... 14
- Old caseous nodule in lung 1
- No evident tubercle in lungs ... 2

Tuberculous meningitis 28
- Active tuberculous caseation in lungs 12
- Miliary tuberculosis in lungs ... 11
- Old caseous nodule in lung 1
- No evident tubercle in lungs ... 4

The fourth table in each series is to be taken as complementary to the third tables. They analyze all the cases, out of the 413, in which ulceration of the intestine had occurred without preëxisting excavation of the lungs. It is most remarkable that no fewer than 86 cases come under this category, or 20.8 per cent. of the whole. Even allowing for a large margin of error, there is still a sufficient number left to prove that, in this country at least, primary ulceration of the intestine occurs frequently. Knowing of these cases, I have never been able to accept statements as to the extreme rarity of primary intestinal ulceration, at least, as applicable to the conditions prevailing in Scotland.

Taking the two series together, it is seen that, in these cases, the abdominal glands were more often tuberculous than the mediastinal, though in many cases both groups were affected; and, secondly, that the fatal event, in nearly half the cases, was due to tuberculous meningitis.

It is hardly necessary to insist that these observations have no bearing on, or reference to, the question of the nature or source—bovine or human—of

the tubercle bacillus causing the lesions. These tables cannot, from their very nature, give any indication in that direction.

The fifth tables analyze the cases of tuberculous meningitis, and detail the immediate foci from which, so far as could be determined, the spread of tubercle had taken place to the meninges. It may be allowed that all, or practically all, cases of tuberculous meningitis have a fatal termination, so that these tables may be taken as conforming more closely to clinical experience than the others I have presented.

It will be seen that in the great majority of cases, the lymphatic glands apparently have provided the focus from which dissemination has taken place, with tuberculous meningitis as the important result, and that the thoracic groups have been more frequently implicated than the abdominal. It is worthy of note that only in a few cases could one determine that excavation of the lungs or ulceration of the intestine had proved the immediate focus from which the spread had taken place. The last tables (No. IV) showed that in many cases of apparently primary ulceration of the intestine tuberculous meningitis had supervened, but in the majority of these the actual focus whence the disease had spread to the meninges appeared to be furnished rather by the associated, broken-down, caseous lymphatic glands. The relative importance of the intestinal ulceration and the glandular tuberculosis cannot, of course, be determined absolutely in all these cases after the lapse of so many years.

FIRST SERIES.—TABLE V.

TUBERCULOUS MENINGITIS.

In 41 Cases out of 105 (39 per cent.).

Primary focus apparently in:		*Dissemination* apparently from active secondary changes in:	
Mediastinal glands	14	Lung: acute tuberculous bronchopneumonia or active caseation	6
		Softening mediastinal glands, no tubercle in lungs, or miliary tubercles only	8
Abdominal glands	4	Lungs	3
		Softening abdominal glands	1
Mediastinal and abdominal glands	2	Lungs	1
		Softening glands	1
Excavation of lungs	6	Lungs	5
		Softening mediastinal glands	1
Intestinal ulceration	9	Glands: Mediastinal	2
		Glands: Abdominal	6
		Glands: Mediastinal and abdominal	1
Of doubtful origin and dissemination			3
Large cavity lung; early ulceration of intestine; some mediastinal and abdominal glands calcareous			1
Glands caseous in neck, groin, mediastinum, and abdomen, with early excavation and ulceration			1
Doubtful whether excavation or bronchial glands primary			1
			41

In 12 cases there were caseous masses in some part of the brain.

SECOND SERIES.—TABLE V.

TUBERCULOUS MENINGITIS.

In 143 cases out of 308 (46.4 per cent.).

Primary focus apparently in:	*Dissemination* apparently from active secondary changes in:
Mediastinal glands 62	Lungs ..... 9 Glands: Mediastinal ..... 49[1] Abdominal 4
Abdominal glands 9	Lungs ..... 1 Abdominal glands 8
Mediastinal and abdominal glands 23	Lungs ..... 8 Glands: Mediastinal ..... 11[2] Abdominal ..... 1[3] Both affected ..... 3[3]
Excavation or old focus in lungs 9	Lungs ..... 2 Intestinal ulcer ..... 1 Glands: Mediastinal ..... 3 Abdominal ..... 2 Both groups affected 1
Acute tuberculous bronchopneumonia ..... 3[3]	
Intestinal ulceration 9	Ulceration ..... 2 Glands: Mediastinal ..... 3[3] Abdominal ..... 4[3]
Of doubtful origin and dissemination ..... 22[3]	
Possibly from tuberculous disease of bone ..... 8[3]	

[1] Tuberculous "tumor" in 3 of these cases, in brain.
[2] Tuberculous "tumor" in 2 of these cases, in brain.
[3] Tuberculous "tumor" in 1 of these cases, in brain.

Now, if we suppose that the great majority of glands affected with tuberculosis really do contain the "bovine" bacillus, as some authorities maintain, we should have to conclude that the majority of the cases in which tuberculous meningitis had caused death had been infected with "bovine" bacilli. The necessary corollary would be that most of these cases, forming altogether 44.5 per cent. of the whole number, had been infected from a bovine source.

The recent reports of the British Royal Commission on Tuberculosis show, however, that the views of these authors are not wholly correct, and that bacilli of both types, "human" and "bovine," can be separated from caseous lymphatic glands, whether abdominal or mediastinal.

Eastwood divides his strains of tubercle bacilli into five grades, which lessen in virulence for bovines as their growth upon nutrient media becomes more luxuriant. These characters are to be taken as, in a general way, separating the strains into the bacilli of "bovine" type and those of "human" type. The tables he has drawn up show that, in the five grades, tubercle bacilli have been separated from lymphatic glands taken from all parts of the body in 13, 6, 9, 13, and 10 cases respectively.*

* Royal Commission on Tuberculosis, Human and Animal. Second Interim Report, Part II, Appendix, vol. iv, pp. 227 to 233.

Summary.

1. One thousand and eighty-five cases came under review, of which 413 had died from tuberculosis. These cases are examined in two series, the first containing 105, and the second containing 308 cases.

2. The ages of the cases varied from three months to thirteen years, approximately 68 per cent. being under five years of age.

3. The lymphatic glands were tuberculous in 97 cases (92.4 per cent.) in the first series and in 243 cases (78.8 per cent.) in the second series. The mediastinal glands were more frequently affected than the abdominal glands, and dissemination took place more frequently, apparently, from the former group.

4. Tuberculosis of the mediastinal glands was commonly unaccompanied by primary tuberculosis of the lungs, but was frequently accompanied by recent tuberculosis of these organs, in many cases evidently secondary to the gland tuberculosis.

5. In nearly half of the cases of tabes mesenterica, there was no ulceration of the intestines, and in one-third of the cases there was no excavation of the lungs, although in some of them the lungs showed early manifestations of tuberculosis. In a number of cases excavation of the lungs was not followed by ulceration of the intestines, although in about half of such cases tabes mesenterica had resulted, the excavation being of some standing.

6. Primary ulceration of the intestines, in absence of any prior excavation of the lungs, was frequently found. It was usually accompanied by caseation of lymphatic glands—mesenteric or abdominal, or both simultaneously. In a large proportion of these cases the immediate cause of death was tuberculous meningitis.

7. Death was due to tuberculous meningitis in 44.5 per cent. of the cases. Dissemination had taken place in most cases, apparently, from caseous lymphatic glands, principally of the mediastinal groups. In 24 cases of meningitis tuberculous caseous nodules were found in some part of the encephalon, but these did not seem in all cases to have given rise to the spread to the meninges.

Tuberculosis en los Niños, con Referencia, en Particular, á la Tuberculosis de las Glandulas Linfaticas.—(Shennan.)

Estos cuadros compendian los resultados de una investigación acerca de los informes de autopsias en casos de tuberculosis en niños que fueron pacientes internos del Hospital Real para Niños Enfermos, Edimburgh.

Demas de 1,000 autopsias, 407 se practicaron en niños que murieron de tuberculosis y estos cuadros están basados sobre los ultimos 307 de estos casos. Las conclusiones importantes se refieren á la frecuencia on que la en-

fermedad ocurre en las glándulas linfáticas y á la diseminación tuberculosa que de ellas partes.

1. Las glándulas se encontraron afectadas en una gran proporción de los casos—77.8 por ciento.

2. Las glándulas torácicas más frecuentemente que las abdominales.

3. Excavación de los pulmones comparativamente rara.

4. En la tuberculosis de las glándulas abdominales, 50 por ciento se encontraron libres de úlceras intestinales y en dos terceras partes de los casos que mostraban ulceración intestinal no había cavidades en los pulmones.

5. La ulceración de los intestinos se presentó en 60 casos del número total (19.5 por ciento) sin que cavidad alguna en los pulmones le haya precedido.

6. La muerte fué debida á la meningitis tuberculosa como causa inmediata en 137 casos (44.6 por ciento) y según aparece, esta última fué debida á la diseminación proveniente de glándulas caseosas—especialmente del torax—en la mayoría de los casos.

La Tuberculose chez les Enfants, surtout celle des Glandes lymphatiques. —(SHENNAN.)

Ces listes résument les résultats d'une investigation des protocoles d'autopsies, des enfants tuberculeux reçus au Royal Hospital for Sick Children à Edinbourg.

Sur plus de 1000 autopsies, 407 furent faites sur des enfants morts de la tuberculose et ces listes résument les derniers 307 de ces cas.

Les faits importants exposés se rapportent à l'incidence de la maladie dans les glandes lymphatiques et à la dissémination de la tuberculose de ces glandes.

1. Ces glandes ont été affecteés dans une fort grande proportion des cas: 77.8 pour cent.

2. Les glandes thoraciques ont été affectées plus souvent que les glandes abdominales.

3. Ou a trouvé relativement peu d'excavations dans les poumons.

4. Dans la tuberculose des glandes abdominales, 50 pour cent n'ont pas été accompagnées d'ulcérations des intestins, et dans deux-tiers des cas ayant ulcérations des intestins, il n'y avait pas d'excavation dans les poumons.

5. Dans 60 cas tout compris (19.5 pour cent), il existait ulcération des intestins, sans aucune excavation pulmonaire précédente.

6. Dans 137 de cas (44.6 pour cent), la mort était immédiatement due à la meningite tuberculeuse, ce qui dans la plupart des cas semblait suivre la dissémination des glandes caséeuses, surtout des glandes thoraciques.

Tuberkulose bei Kindern, besonders mit Rücksicht auf die Lymphdrüsen-Tuberkulose.—(SHENNAN.)

Die folgenden Tabellen veranschaulichen die Ergebnisse einer Analisierung der Autopsien jener Fälle von Tuberkulose in Kindern, die im Royal Hospital for Sick Children, Edinburgh, behandelt wurden.

Von mehr als 1000 Autopsien betrafen 407 solche Kinder, die an Tuberkulose gestorben waren; den Tabellen liegen die letzten 307 dieser Fälle zu Grunde.

Wichtige Momente sind die Häufigkeit, mit welcher die Erkrankung in den Lymphdrüsen vorgefunden wurde und die Dissemination der Tuberkulose aus diesen Drüsen.

1. Affection der Drüsen war in einer sehr hohen Proportion vorhanden —77.8 Prozent.

2. Die thoracalen Drüsen waren häufiger angregriffen als die abdominalen.

3. Lungen-Cavernen wurden verhältnismässig selten vorgefunden.

4. In 50 Prozent der Fälle von Tuberkulose der abdominalen Drüsen war keine Ulceration des Darmes nachweisbar; in zwei Dritteln jener Fälle, wo sich Darmgeschwüre vorfanden, war keine Cavernenbildung in den Lungen vorhanden.

5. Insgesamt zeigten 60 Fälle (19.5 Prozent) von Darmgeschwürbildung keine Lungencavernen.

6. In 137 Fällen (44.6 Prozent) war der Tod direkt auf tuberkulöse Meningitis zurückzuführen, und schien diese zumeist eine Folge von Dissemination aus vorwiegend thoracalen Drüsenvorgängen gewesen zu sein.

THE RELATION OF MEASLES, WHOOPING-COUGH AND INFLUENZA TO TUBERCULOSIS IN CHILDHOOD.

By Dr. Edgar P. Copeland,
Washington, D. C.

Were tuberculosis but an occasional concomitant of these infections, their wide-spread prevalence would, alone, warrant a careful consideration. The public, at least, has long entertained a fallacious idea with respect to these common diseases of childhood. Indeed, measles and whooping-cough have been, and continue to be, popularly regarded as conditions trivial in nature—something for the child to have and have done with. The dangers of such a policy cannot be overestimated. Dr. Newton Pitt, in a recent issue of the "Guy's Hospital Report," has characterized measles and whooping-cough as the most important factors in the mortality of early life. Influenza—no doubt because of its apparent low mortality as compared with its incidence—has been looked upon with absolute indifference.

It is not, however, my purpose to discuss these diseases and the host of complications that contribute to such mortality as is observed, but rather to emphasize the relationship existing between these infections, on the one hand, and tuberculosis, in all its protean manifestations, on the other.

Tuberculosis is observed to follow upon these diseases, both in the rôle of complication and sequel, but in just what proportion of cases is difficult to determine. Bentzel and Jürgenson find from 5 to 16 per cent. While I hope to show that this tuberculosis is, for the most part, dependent upon a preëxisting latent focus, the possibility of infection from direct exposure at the time is conceded, and should be borne in mind.

Some idea of the frequency with which these diseases are associated may be gathered from the figures of Ganghofner in Prague. In 176 autopsies on children dying from measles, 55, or 31.2 per cent., had tuberculosis. Heller, of Kiel, in 714 cases dead from acute infectious disease, including measles, found 140, or 19.6 per cent., tuberculous; Councilman, of Boston, in 220 cases, found 35, or 16.0 per cent., tuberculous; Baginsky, of Berlin, in 806, found 144, or 17.8 per cent., tuberculous; Ganghofner himself, of Prague, in 973 cases, found 253, or 28 per cent., tuberculous. These figures represent the definite presence of tuberculosis in association with the infectious diseases, and more particularly with measles, but do not enlighten us as to the relation

existing. No doubt in a large proportion death resulted from some cause but remotely related to the tuberculous conditions. Did tuberculosis follow the acute infections in all cases in which there existed a latent tuberculous focus, the mortality would, I am sure, be greatly increased. For instance, in a recent epidemic of measles in the Washington Orphan Asylum there was not, in 75 cases, a single case complicated with tuberculosis; nor has tuberculosis manifested itself in any of the patients after a lapse of four years. It is interesting to note that but one case of bronchopneumonia was observed, though the children average not over seven years. Certainly some of those children must be potentially tuberculous. On the other hand, no figures available can convey an adequate idea of the large number of cases in which the manifestation of tuberculosis is so long delayed as to obscure the rôle of previous disease in its development. The average length of time elapsing between the infection and the appearance of definite lesions in tuberculosis is variously estimated as from a few months to years.

The difficulties met with in an attempt to arrive at definite conclusions with regard to this relationship are obvious. The records of hospitals receiving measles and whooping-cough in no instance deal with the sequels of these diseases; few post-mortem examinations are had in such institutions, in this country; while the previous histories of tuberculous patients are rendered unreliable from the very nature of the disease. For example, a colored female, aged seven years, dying in The Children's Hospital of this city, has just come to autopsy at the time of writing. The examination showed general miliary tuberculosis, with lesions most advanced in the lungs. Now, in spite of the fact that this child has a record of having had measles six months before, there is no information that would make it even reasonable to assume that latent tuberculosis did not previously exist. Landis, of Philadelphia, in a recent investigation of a series of cases of measles, states, that "but little information was gained in this study as to the relation existing between tuberculosis and measles."

Considering the rôle of latent foci in the production of tuberculosis, it seems important to emphasize the prevalence of the condition in children. According to Burton Fanning, it is stated that a more careful examination of the offspring of tuberculous women and cows reveals the tubercle bacilli in a larger proportion. The number of infants affected steadily increases until, at the age of one year, autopsies show 7 and 8 per cent. Kelynack states that 40 per cent. of all children dying under fifteen years of age show evidence of tuberculosis. Those of us working in The Children's Hospital of this city, where we have to do with children under twelve years, are impressed with the number of cases of tuberculosis coming to autopsy, though the peculiar susceptibility of the negro race must be taken into consideration. This latent tuberculosis, where the balance of power between the invader

and the internal resistance is not well maintained, is evidenced, as characterized by Goodhart, by "a tribe of glandular and other affections, ophthalmia, discharges from ears, suppurating glands in the neck, and caseating mediastinal glands." In addition to these visible signs of disease, there is, what can best be expressed by quoting Kelynack, "An immense amount of impairment of health, crippling and lowering of power to resist morbid influences, resulting directly from tuberculosis, without producing a mortality that can be statistically expressed."

In considering the rôle of the acute infections in the etiology of tuberculosis, we are unfortunate in not being in possession of more definite facts with respect to the exciting causes of at least two of these conditions. We can, however, observe certain clinical and pathological phenomena common to all.

They are alike characterized by a highly infectious nature, by a tendency to occur epidemically, by a marked catarrhal inflammation of the mucous membranes over the entire body, and by greatly lowered resistance. This catarrhal condition constitutes a part of these diseases, and is not to be confused with the processes observed to follow upon infection with the streptococcus and other secondary invaders. It is, furthermore, attended with intense hyperemia and lymphatic activity.

In this catarrhal condition of the respiratory passages we have, I believe, the key to whatever connection exists between tuberculosis and these diseases. Not, however, in the sense that such inflammation predisposes to infection, but rather in that it promotes the generalization of a localized latent process. In discussing the etiology of tuberculosis, Fowler says that: "Having regard to the extreme prevalence of catarrhal affections of the bronchi and the relatively small number of cases in which tuberculosis follows, I am disposed to think that the importance of this factor in the etiology of the disease has been exaggerated."

The assumption that catarrhal affections of the respiratory mucous membranes heighten the susceptibility to tuberculous invasion is, of course, based upon the acceptance of the inhalation theory of infection.

With respect to children, it would certainly seem true that in the light of constantly growing mass of evidence the importance of the inhalation theory has proportionately decreased. Von Behring, Calmette, Guérin, Deliarde and others in Europe, and Schroeder and Cotton, of the U. S. Department of Agriculture, have shown experimentally in animals, and in some instances clinically in children, the greater dangers of ingestion. They have pointed out, all but conclusively, that our ideas of what constituted the evidence of the intestinal origin of the disease were entirely at fault. Mesenteric lymph-nodes have been demonstrated to contain tubercle bacilli even in the absence of apparent pathological lesion, and the thoracic lymph-nodes have been

shown to be primary points of manifest change, irrespective of the site of infection or inoculation. Coupled with these facts comes the knowledge of the all but negative potency of the tubercle bacilli of dried secretion.

I have called attention to the hyperemia and lymphatic activity associated with catarrhs of the infections. Having in mind the prevalence of latent tuberculosis, we can easily picture the mechanism of dissemination in the production of active disease. The lymph-streams draining the inflamed areas of mucous membrane, swollen to many times their normal volume, flowing through these foci of potential mischief, set free and carry into the circulation tubercle bacilli, for distribution over the entire body. The resulting picture depends, first, upon the amount and virulence of the infectious agent; and, secondly, upon the relative resistance of the tissue to which it is conveyed. The condition most commonly observed in children is that of a general miliary tuberculosis, with lesions most advanced in either lungs or meninges. According to Nothnagel, meningitis is seen in the large majority of cases. Our post-mortem work at the Children's Hospital leads me to believe that, with the possible exception of disease of bones and glands, tuberculosis in children is almost invariably general in character. We have, however, found the lesions in the lungs most advanced in the large proportion of all cases. In 284 autopsies, 151 showed predominating pulmonary changes, whereas but 46 showed meningeal changes in excess. Doubtless the cases of bronchopneumonia upon which tuberculosis is presumed to have become engrafted are cases of miliary tuberculosis from the beginning. Such rapid diffusion of tubercle is not often seen confined to one system. When the osseous system becomes the *locus minoris resistentiae*, the development of manifest lesions is usually delayed for months, and even years.

The rôle of latent tuberculosis is nowhere more strikingly shown than in institutions for children, where the incidence of the disease after the acute infections is high. Under such conditions the opportunities for infection obviously do not exist. Dr. Nothrup, discussing measles in this connection, says: "There remains, now that diphtheria is removed from the list, but one scourge in institutions for children—a plague, and that plague is measles." Of course, the incidence of tuberculosis is not represented by the mortality, but other than the definite cases observed, contributes largely to such mortality. Henoch is responsible for the statement that the child is to be feared more than the disease in an attack of measles, and, further, that he has not observed danger except with those potentially tuberculous.

Whooping-cough and influenza occupy the same position relatively as measles. The frequency with which the former complicates measles adds, of course, a double danger. The extreme grade of inanition so often observed in whooping-cough, even with its associated depression, seems insufficient, in the absence of latent disease, to produce disseminated tubercle.

Influenza, while giving rise to the most perplexing and alarming pulmonary phenomena, is seldom, if ever, followed by tuberculosis where such condition did not previously exist. While mortality tables show a high death-rate from tuberculosis during epidemics of influenza, they represent an increased mortality rather than an increased morbidity.

Galbraeth, in investigating the frequency with which persons in the pretuberculous state are affected, found in 150 consecutive cases 51 per cent. infected with the Peiffer bacillus, and characterized influenza as one of the causes that permits the spread of tuberculous mischief. No doubt, as Burton Fanning says, it is extremely common to call influenza what is in reality nothing more than the fever and constitutional disturbance of commencing tuberculosis. It is most certain that the tuberculosis lung offers a most favorable medium for the reception and persistent growth of the influenza bacillus.

In the light of our present knowledge, the following conclusions would seem justified: that, taking into consideration the enormous morbidity of measles, whooping-cough, and influenza, the incidence of tuberculosis as a complication or sequel is of relatively small importance; that its development is all but invariably dependent upon the preëxistence of latent disease; and that its dissemination is probably due to lymphatic activity resulting from the pulmonary inflammations associated with these diseases.

I would not, however, be understood as presenting anything upon which could be based the relinquishment or the relaxing of one element of the safeguard which should be thrown around all, weak and strong alike, at such times. It is greatly to be hoped that the great minds so diligently and unselfishly devoted to unraveling the mysteries of this potent enemy of the animal kingdom may at this Congress present such facts as will serve to throw greater light upon the subject that I have endeavored to treat.

La Relacion de las Enfermedades Infecciosas, Sarampion, Tos Ferina é Influenza con la Tuberculosis.—(COPELAND.)

El tema es interesante debido á la extensa diseminacion de estas enfermedades. Es mirado por el publico con insuficiente seriedad. Aunque la tuberculosis se observa como una consecuencia ó complicación del sarampión, la tos ferina y la influenza, la relación y proporcion de estas enfermedades y la tuberculosis es dificil de determinar. Las estadísticas demuestran lesiones tuberculosas en 31.2% de los fallecidos á consecuencias del sarampión. Importancia de la prevalencia de la tuberculosis latente. La inflamacion catarral de las membranas mucosas, asociada de hiperemia y actividad linfática, es comun á todas las tres clases de enfermedad, llave de la relacion.

La actividad linfática determina la diseminacion en el organismo. El cuadro revela por lo general una tuberculosis miliar, los sintomas pulmonares predominan. La influenza aunque da origen á muchas condiciones oscuras del pecho, es raramente seguida de tuberculosis exeptuando los casos en que una condición latente existe.

Conclusión:—Conciderando la prevalencia del sarampion, la tos ferina é influenza, la tuberculosis no se manifiesta con frecuencia suficiente para ser de gran importancia: que su desarrollo en todo caso depende de la presencia de un foco latente de la enfermedad; y que la diseminación es directamente debida á la actividad linfática.

Die Beziehungen der Infectionskrankheiten—Masern, Keuchhusten und Influenza—zur Tuberkulose bei Kindern.—(COPELAND.)

Der Gegenstand ist von Wichtigkeit wegen der weitverbreiteten Natur dieser Krankheiten. Die Öffentlichkeit betrachtet dies mit ungenügendem Ernste. Obwohl wahrgenommen ist, dass Tuberkulose nach Masern, Keuchhusten und Influenza als Folge und Complication auftritt, ist es schwer die Beziehungen und das Verhältnis von Fällen zu bestimmen, in denen die Verwandtschaft beobachtet wird. Die Statistik zeigt tuberkulöse Verletzungen in 31.2% der Todesfälle von Masern. Häufigkeit von latenter Tuberkulose von Wichtigkeit. Catarrhale Entzündung der Schleimhäute in Verbindung mit Hyperämie und lymphatischer Activität ist allen drei Krankheiten gemeinsam, der Schlüssel zur Verwandtschaft. Lymphatische Activität bestimmt eine Verbreitung über den Körper. Das Krankheitsbild ist gewöhnlich eine allgemeine Miliartuberkulose mit vorwiegenden Lungensymptomen. Influenza, obwohl zu vielen unklaren Brusterscheinungen die Ursache gebend, ist selten von Tuberkeln begleitet, ausgenommen wo ein latenter Zustand vorhanden ist. Schlussfolgerungen: Wenn man die Häufigkeit von Masern, Keuchhusten und Influenza in Betracht zieht, folgt Tuberkulose nicht genügend oft, um von grosser Wichtigkeit zu sein; ihre Entwicklung hängt in allen Fällen von einem latenten Erreger der Krankheit ab und die Ausbreitung ist eine dirkte Folge lymphatischer Activität mit vorwiegenden Lungensymptomen.

ON VON PIRQUET'S CUTANEOUS TUBERCULIN TEST ON CHILDREN IN THE FIRST YEAR OF INFANCY.

By Prof. O. Medin, M.D.,
Stockholm.

Since last year, when I became familiar with cutaneous tuberculin test, as a diagnostic in tuberculosis, I have used it on a number of children of all ages, as well as on adults. On the present occasion, however, I shall confine myself to an account of the employment of this means in respect to children of the tenderest age.

To begin with, I must mention that the experiments carried out by some of my colleagues in Stockholm had altogether discouraged me from making any attempt to use the so-called ophthalmo-reaction. The accounts given by physicians abroad of the evil results of its employment had already warned me against it, and, as I said just now, my fears were fully confirmed by what I saw at home. It would never even enter my mind to use the ophthalmo-reaction on older children, some of whom show intense reactions; the risk of exciting a more or less acute conjunctivitis, not to speak of the possibility of exciting keratitis, is not needlessly to be incurred. We have not the right to expose any one to the danger of such a misfortune: at least, the test should never be made unless the patient voluntarily consents to expose himself to it, and is capable of clearly understanding the risk he is running. As a rule, there should be no thought of making experiments on infants which can cause suffering and bodily harm, and more especially is this the case with regard to poor little orphans.

Last autumn, after I had seen in Vienna some of the children whom Dr. von Pirquet had tested with the cutaneous tuberculin inoculation, and having on that occasion convinced myself that even those children showing intensive reaction did not suffer in any way from the operation, I tried the experiment on a number of older children in Stockholm. As the result of numerous experiments on these infants I became fully persuaded of the harmlessness of the cutaneous method, as not in one single instance did it cause them any inconvenience when carried out in the manner prescribed by Dr. von Pirquet, whose method I consistently followed. Having made quite sure of this fact, I considered that I could safely begin my experiments with the very youngest infants, and it is of the experience gained in this

cutaneous tuberculin inoculation of children of less than one year old that I wish to say a few words.

I commenced my experiments in November of last year among the children at the Foundling Hospital (Allmänna Barnhuset) in Stockholm. Since that date, with the help of my assistants, I have carried out this cutaneous tuberculin inoculation on no less than 400 children under one year old. I have almost uniformly inoculated the lower part of the arms; at the first inoculation I have as uniformly inoculated in three different spots, and with a different mixture at each spot—at the highest point with a 25 per cent. tuberculin mixture; at that in the middle with a 10 per cent. solution; and at the lowest point of inoculation, with control-liquid without tuberculin, this control-liquid consisting of one part carbolic-glycerin and two parts physiological salt solution. I think I ought also to mention that I have used Koch's "Alt-tuberculin" and the inoculation-syringe prescribed by Dr. von Pirquet.

The results of my inoculations can be summed up in a few words. As before mentioned, we have inoculated no less than 400 children under one year of age, about 350 of them being but a few months old. In general, we know little or nothing as to the health of the parents, or of the previous condition of health of the infants when they are brought in to the hospital; the greater number appeared to be entirely free from disease and well nourished. But while symptoms of all kinds of the more or less ordinary diseases peculiar to infants were found among some of the children, it was only now and then that there was any real reason to suspect that they had been, or were then, suffering from tuberculosis. It is, as a rule, no very easy thing to diagnose with any degree of certainty the existence of tuberculosis in children during the first few months of their lives, but to do so at an early stage of the disease becomes a matter of exceptional difficulty, and so every diagnostic expedient of any value is always very welcome. It is not impossible that the cutaneous tuberculin inoculation can become such a means, but it will certainly never be decisive for the diagnosis of tuberculosis, or not tuberculosis, in the case of the very youngest infants any more than in adults.

Of the 400 children tested, 390 did not show the slightest trace of a reaction in the neighborhood of the inoculated spots. Those spots that had been inoculated with the tuberculin mixture had precisely the same appearance as those which had been treated with the control-liquid. In 58 of these cases the inoculation was renewed—in one case once, and in some instances several times, but always with the same negative results.

Of the 390 children just mentioned, who never showed any reaction, 31 died after a short time, or within a few months at most. Twenty-nine of these 31 died of other diseases, and the post-mortem examination showed no

trace of tuberculosis. In two cases, however, tuberculosis was found in optima forma. One of these two children came under my observation on November 23, 1907, and the cutaneous tuberculin test was made the same day. The child had pronounced symptoms of tuberculous meningitis, but showed no sign of reaction to the tuberculin test, either cutaneous or general. It died two days afterward. This child was seven months old. In this instance the observation made by von Pirquet was confirmed, that during the last few days (about ten) before death, children do not show any reaction, even if, or, possibly just because, they are suffering from very extensive and greatly developed tuberculous changes.

The other child, which had not shown any reaction, but which, after death, was found to have been infected with tuberculosis, was two months old when it was inoculated, on April 7, 1907. The child was suspected of having syphilis, and toward the end of the month it showed evident signs of this disease. On May 11th the child began to be subfebrile with irregular temperature-curves; a little later, fine atelectatic râles were observed in the left lung. On May 25th the child died without having presented such symptoms that any diagnosis of tuberculosis could be made. It is true that tuberculosis develops itself with the greatest rapidity in children during the first months of life, and it is not altogether impossible that when the child last mentioned was inoculated, on April 7th, it had not then been attacked by the disease. Still, I am more inclined to believe that infection had taken place before the date mentioned, and that the child did not show reaction in consequence of some circumstance with which we are unacquainted, but which probably in exceptional cases has a disturbing influence on the experiment.

Of the 400 infants inoculated, only 10 have reacted positively; in other words, in the case of infants only 2.5 per cent. show any reaction. This is a fact of great importance. We do not find nearly so many tuberculous individuals among infants under one year of age as we do among older children, and this tends to confirm my opinion that tuberculosis is not often conveyed to children during their earliest infancy, to become latent and break out at some future time. If such latent tuberculosis often existed in infants, it is in the highest degree likely that a greater number of them would, too, show reaction to the tuberculin test. We see, for example, how older children, even if they are suffering from some very slight tuberculous glandular or osseous affection, react very intensely; and why, then, should not the reaction display itself in the same way in the case of infants. It is certain, too, that those infants who really are infected with tuberculosis show reaction, in nearly every case, to the cutaneous tuberculin test.

Of the 10 children who reacted positively, two have since died, both of them at autopsy showing extensive tuberculous changes. One of these two

was born April 30, 1908; was received into the Foundling's Hospital on June 2d, weighing then only 3250 grams. It was brought up by the bottle and suffered from chronic enteritis. Was given the breast, but showed no improvement; in the middle of July it was noticed that the child had a spasmodic cough and that the spleen was somewhat enlarged. The temperature was the whole time very irregular. On July 21st a cutaneous tuberculin test was made in accordance with von Pirquet's method. Twenty-four hours later a positive reaction was observed. The hacking cough continued and the child grew thinner and thinner, weighing on July 28th only 2820 grams; nothing abnormal could be clearly distinguished in the lungs. The child died on July 30th, the autopsy showing tuberculosis with caseous transformation in the bronchial lymph-nodes, miliary tuberculosis of the lungs, the spleen, the liver, and of the mesenteric lymph-glands. In this case tuberculosis had been suspected on account of the clinical symptoms, but no definite localization could be determined. The cutaneous tuberculin test decided the diagnosis, which was confirmed by the autopsy.

The other child who also showed the reaction was seven months old when it was admitted to the Foundling Hospital on November 19th. It was atrophic and had small but clearly palpable swellings of the lymphatic glands of the neck and was soon suspected of having tuberculosis.

On December 3d Pirquet's test was made and resulted positively, although feebly so. There was no reaction at the control spot, but at the other spots there were seen very small and somewhat irregular patches of a rather vivid red color, and of inconsiderable height. On a fresh inoculation being made on December 8th, the reaction was not quite so pronounced, and at a final attempt, made on the 10th of the same month, no reaction at all was observed, either after twenty-four, or forty-eight hours. The child died on December 29th and presented at autopsy tuberculosis in nearly all parts of the body. I made an observation in respect to this case which may possibly be of some importance. The child was inoculated on December 3d, and on the following day its temperature rose, remained high till the 5th, and on the 6th rose to 38.8° C. (101.8° F.), and on the 7th returned to normal. On December 8th it was observed that the child had an exanthem with very small spots which disappeared after four days. It is possible that this rise in temperature and this exanthem were the results of the tuberculin inoculation. But before I can place any confidence in this hypothesis, I should like to see the phenomenon confirmed by the results of further inoculations.

Finally I should like to say a few words on the eight infants who reacted positively, but who are still alive. At the first inoculation, one child did not react at all and another very feebly, but at a second inoculation, made a couple of weeks afterward, a reaction was clearly visible. One of these two infants was nine months old when it was admitted to the Foundling Hospital

on April 29th last; at the end of May it began to cough and showed signs of bronchitis. On May 28th an inoculation was made, and the following day there was observed an inconsiderable redness at the spot which had been inoculated with the 25 per cent. tuberculin mixture. The reaction was not considered as positive. It was the same case with an inoculation made on June 11th. The cough and the bronchitis continued. On June 25th a fresh inoculation was made, and reaction was clearly visible, for both the 10 per cent. and the 25 per cent. mixture. I have not the least doubt but that this infant is suffering from tuberculosis.

Another child, five months old, which suffered from a spasmodic cough and had been attacked for a week previously by repeated convulsions, did not show reaction on July 14th, but reacted positively on July 31st. It is probable that this child, too, has tuberculosis, although at the end of August no clinical proof of the accuracy of this diagnosis had yet been noticed.

The 6 infants who reacted positively on the first occasion of inoculation and who are still living, reacted in very different ways. One child, with evident clinical symptoms, reacted at once and very clearly. Another, that reacted plainly on July 31st, has not shown clinical signs of tuberculosis, but it is very possible that it is suffering from the disease. A third child that reacted clearly to the test was a strong, well-nourished, five-weeks-old baby that showed no sign of the disease; but it must be remarked that this child's mother has suffered from tuberculosis of the spine for two years, and now has pulmonary tuberculosis also. Is it possible that such a child can be tuberculinized while still an embryo, and that is the reason it reacts positively without itself being affected with tuberculosis? It will be of the greatest interest to follow the development of this case. Up to the age of two months the child is still perfectly healthy. Three infants, who did not react otherwise than by the appearance of an unimportant redness twenty-four hours after inoculation around the 25 per cent. inoculated spot, have not yet, it is true, shown any signs of tuberculosis, but I suspect all the same that they are not altogether free from the disease. This suspicion is based partly on the fact that infants really free from tuberculosis never show the least sign of redness around the inoculated spots twenty-four hours afterward, and partly on the observation made, that infants who at first reacted in the uncertain way described, have later on shown a perfectly evident reaction. My conviction is this, that in von Pirquet's cutaneous tuberculin test made on infants in the first year of their age, even the least sign of a reaction is of importance. Should this supposition of mine be confirmed by further experiments, it must then be acknowledged that this harmless and easily executed operation is of great value as a diagnostic auxiliary when it is a question of diagnosing tuberculosis in infants during the first few months of their lives.

THE OPSONIC CONTENT OF BREAST-MILK.

By Dr. Wm. J. Butler,
Chicago.

Ehrlich, in his studies on immunity through heredity and nursing, found that the young of mice immunized against ricin, abrin, and tetanus possessed a passive immunity, and that this increased and continued while they were nursed by the immunized animals, but that it diminished when they were suckled by normal mice. He also found that if the young of normal mice were nursed by mice immunized against ricin, abrin, and tetanus, they acquired a passive immunity against these agents. This proved that their antitoxins were excreted by the mammary glands of the immunized animals. Wernicke was able to demonstrate the excretion of antitoxin in the milk of mothers immunized against diphtheria.

Later, investigations were carried on to determine if antibodies were excreted in this manner. Widal and Sicard found agglutinins in the milk of mothers who had typhoid. Kraus demonstrated agglutinins in the milk of animals immunized against typhoid, colon, and cholera bacilli. Moro, on the other hand, could not find bactericidal substances in the breast-milk of healthy mothers. Turton and Appleton inquired into the opsonic contents of human and cows' milk for staphylococcus and tubercle bacillus with negative results. Recently Eisler and Sohma have investigated the opsonins of milk of normal and immunized animals, finding none in the former case, but found them in the milk of immune animals.

As the first part of this work, directed to investigating the opsonins of breast-milk, experiments were undertaken with a view of determining:

First, if the breast-milk of normal mothers contains opsonins.

Second, if so, to what extent compared with their blood-serum.

Third, if cows' milk contains opsonins.

Wright's technic was adhered to in making the examinations, which were carried out for four organisms: namely, staphylococcus aureus, gonococcus, pneumococcus, and tubercle bacillus. For the first three mentioned organisms, emulsions of about equal thickness, averaging six to seven to the cell, were used. For the tubercle bacillus, an emulsion averaging 1.25 to 1.5 to a cell was employed. The breast-milk was obtained from mothers

within ten days from date of parturition. Their blood was taken at the same time. The cow's milk was obtained from a local dairy.

As controls, the different organisms were examined with blood-corpuscles alone, in order to ascertain the extent of spontaneous phagocytosis. The washed blood-corpuscles of a laboratory worker were used. The number of bacteria taken up by fifty leukocytes in each slide, representing respectively the examinations with staphylococcus, gonococcus, pneumococcus, and tubercle bacillus, were counted and the average phagocytic count per leukocyte for each organism was determined and these counts are entered in the tables.*

Following are the results of examinations:

STAPHYLOCOCCUS.

Mother	Average Phagocytic Count Per Cell.		Milk Index.	Average Milk Index
	Blood-Serum.	Breast-Milk.		
Gilson	6.62	.16	.023	.022
Gunther	6.54	.16	.023	
Maronla	6.64	.18	.026	
Shoner	7.48	.14	.02	
Easily	6.78	.10	.014	

Cows' Milk: Average phagocytic count, .10; Index, .014.
Without serum or milk: Average phagocytic count, .34; Index, .05.

GONOCOCCUS.

Mother.	Average Phagocytic Count.		Milk Index.	Average Milk Index.
	Blood-Serum.	Breast-Milk.		
Gilson	6.32	.12	.02	.025
Gunther	6.16	.24	.04	
Maronla	6.28	.12	.02	
Shoner	6.28	.24	.04	
Easily	5.89	.08	.013	

Cows' Milk: Average phagocytic count, .04; Index, .006.
Without serum or milk: Average phagocytic count, .1; Index, .016.

* The indices of the human milk are figured against the blood-serum of the corresponding mother. The average index of the human milk and the indices of the cows' milk and the salt solution are figured against the average phagocytic count of the sera.

PNEUMOCOCCUS.

Mother.	Average Phagocytic Count.		Milk Index.	Average Milk Index.
	Blood-Serum.	Breast-Milk.		
Gilson	6.52	.62	.1	.11
Gunther	6.04	.8	.13	
Maronla	5.6	.78	.13	
Shoner	6.14	.54	.09	
Easily	6.06	.66	.11	

Cows' Milk: Average phagocytic count, .12; Index, .02.
Without serum or milk: Average phagocytic count, .18; Index, .03.

TUBERCLE BACILLUS.

Mother.	Average Phagocytic Count.		Milk Index.	Average Milk Index
	Blood-Serum.	Breast-Milk.		
Gilson	1.54	.0	.0	.077
Gunther	1.44	.06	.04	
Maronla	1.36	.24	.16	
Shoner	1.32	.28	.19	
Easily	1.44	.0	.0	

Cows' Milk: Average phagocytic count, .26; Index, .18
Without serum or milk: Average phagocytic count, .06; Index, .04.

The average indices for the milk and salt solution compared to the blood-serum of the mothers for the various organisms are as follows:

	Breast-milk.	Cows' Milk.	Control.
Staphylococcus Aureus	.022	.014	.05
Gonococcus	.025	.006	.016
Pneumococcus	.11	.02	.03
Tubercle Bacillus	.077	.18	.04

It will be observed in the above averages that while the indices of the human milk exceed those of the cows' milk with the first three organisms, the index of the control with salt solution is greater than that of human milk for staphylococcus. The degree of spontaneous phagocytosis is but little short of that for human milk with gonococcus. The index of human milk for pneumococcus is somewhat higher than that for cows' milk or for the salt solution. On the other hand, the index of cows' milk for tubercle bacillus is greater than with human milk.

The greater index of breast-milk for pneumococcus and of cows' milk

for tubercle bacilli might suggest the presence of pathological opsonins. My results with the tubercle bacillus are practically the same as those obtained by Turton and Appleton for human and cows' milk. In another series of examinations with pneumococcus, I found a greater phagocytosis with cows' milk and salt solution than with human milk.

The slight differences found in the above indices between the milk of normal mothers and cows' milk with the organisms examined cannot be taken into consideration in estimating their relative opsonic power, which latter does not appear to be any greater than that obtained with physiological salt solution, with which the emulsion of bacteria is made.

Investigación del Poder Opsónico de la Leche Humana con Relación al Bacilo de la Tuberculosis.—(BUTLER.)

Examen de la leche materna en mujeres normales para descubrir las opsoninas. Comparación entre las opsoninas contenidas en la leche y en la sangre de las mismas. Opsoninas de la leche de vaca.

Recherche sur le Pouvoir Opsonique du lait de Femme Contre le Bacille de la Tuberculose.—(BUTLER.)

Analyses du lait de femme normales pour constater la présence d'opsonines. Comparison du contenu opsonique de leur sang avec celui de leur lait. Les opsonines dans le lait de vache.

Prüfung der opsonischen Kraft der Muttermilch für Tuberkelbazillen. —(BUTLER.)

Opsonische Untersuchungen von normaler Muttermilch. Vergleichweise Untersuchung des opsonischen Indicis des Bluts und der Milch von normalen Müttern. Die Opsonine der Kuhmilch.

SECTION IV.

Tuberculosis in Children—Etiology, Prevention, and Treatment (*Continued*).

SECOND DAY. MORNING SESSION.

Tuesday, September 29, 1908.

MILIARY TUBERCULOSIS. TUBERCULOUS MENINGITIS. LOCALIZATION OF TUBERCULOSIS IN CHILDREN.

The President, Dr. Jacobi, called the Section to order at ten o'clock.

REPORT OF A CASE OF MILIARY TUBERCULOSIS, PROBABLY OF BOVINE ORIGIN, IN A CHILD, AGED FOUR AND ONE-HALF MONTHS.

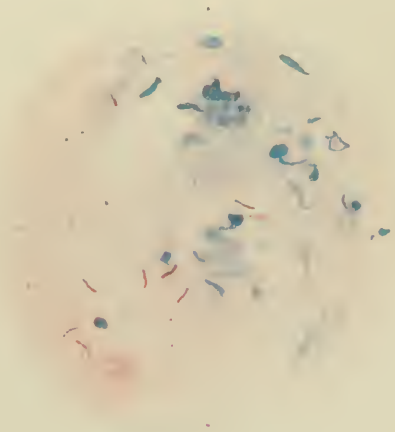
By Edgar M. Green, M.D., and A. L. Kotz, M.D.

We report this case of acute miliary tuberculosis in an infant because we feel it is interesting from the fact that it seems to be of bovine origin, establishes clearly the time of infection, and also period required to develop fully in the child. Our objects are to furnish an example of the transmissibility of bovine tuberculosis to the human being, and to show that the attack may be acute and the disease may be transmitted to the human being when there is but one cow suffering from tuberculosis in a herd of ten or twelve cattle. Milk from high-bred cattle may be particularly dangerous, and, even from dairies which are clean and well cared for, an infection may occur, unless such cattle are most constantly watched, inspected, and tested with tuberculin.

The history of the case is as follows:

Female child, born December 3, 1907. Mother was able to nurse the child for only two weeks. During this period the child lost in weight, its weight at birth having been 7 pounds 2 ounces. At the end of this period the child was placed upon modified milk obtained from a herd of Jersey

Photo-micrograph of pancreas showing disintegration of organ by reason of caseation.



Pancreas. Margin of necrotic area, showing fragments of epithelioid cells and tubercle bacilli.

cows. The number of bacteria shown by examination of this milk was 3000 to 6000 per cubic centimeter. This milk was used during the next two weeks, when milk was obtained from a dairy of ordinary cattle furnishing certified milk. The number of bacteria per cubic centimeter averaged 4000 to 8000. The child soon improved and continued gaining in weight, the weight curve being exactly parallel with the normal curve until the completion of the twelfth week. The child now began losing weight; bowels became loose; stools frequently acid and fermented. The abdomen soon became enlarged, flesh was lost rapidly, temperature ranging between 99° and 100° F. This loss in weight continued uninterruptedly, although the stools became quite normal in consistence and quality. Death occurred at the age of four and one-half months.

Autopsy: Body of female infant extremely wasted, abdomen much distended, skin tense. No enlarged glands to be seen. Incision revealed great wasting of abdominal muscles and adhesion of abdominal contents to anterior abdominal wall; no fluid in abdomen; in fact, abdominal cavity obliterated. Omentum largely infiltrated with tubercles; stomach distended and greater curvature directed forward and lying just under abdominal wall. Pancreas superficially located and covered with adhesions which it was impossible to break up. Small curvature of stomach largely studded with tubercles. Peritoneum covering spleen thickened and fully studded with tubercles. Kidneys apparently free from involvement. Mesenteric glands fully infiltrated and almost all parts of peritoneum involved. Liver possibly somewhat involved. Mediastinal glands much involved.

Microscopical examination of the tubercular foci showed that they were fused into flat, yellowish masses the size of a lentil. None of the tubercles were larger than this, and uniformity of size was a remarkable characteristic. In the pancreas these masses were numerous, completely disorganizing the viscus. This is a rare condition, as the pancreas is said to seldom be involved in tuberculosis of the abdomen. In the intestines the tubercles were entirely confined to the serous and subserous coats, and these were completely packed with tuberculous deposits. Muscular layers and mucosa were atrophied with small-celled infiltration. The tubercular masses consisted of lymphoid and epithelioid cells surrounding small foci of coagulation necrosis, with very rarely giant-cells present. The tubercle bacilli were most abundant in the epithelioid layer and on the outer surface of the necrotic foci. They were absent in the necrotic tissue and near the giant-cells. Most of the bacilli were shorter, thicker, and less beaded than the ordinary bacilli found in human tissue.

This agrees with the investigation and measurements made by Theobald Smith and published in the "Journal of Experimental Medicine," in which he says that bovine bacilli measure from 1 to 1½ micromillimeters, while the sputum bacillus measures from 1½ to frequently 2 micromillimeters.*

The child's paternal grandmother died of tuberculosis many years ago; one paternal uncle also died of tuberculosis three or four years ago in the same house where this child was born. The house was thoroughly fumigated after the death of this uncle. The mother of the child is well and has been for some time; she has no history of tuberculosis; in fact, after the

* Theobald Smith, in the Journal of Experimental Medicine.

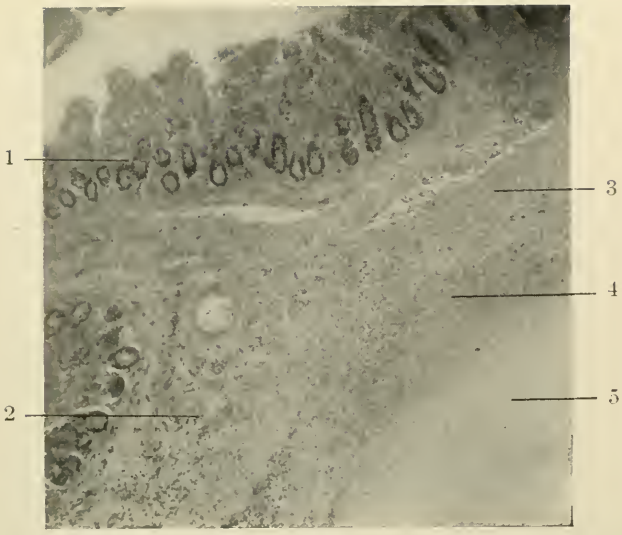
death of the child, careful physical examination revealed no signs of any tubercular disease. The father is also well and apparently free from disease of any sort. No member of the household in which the child was born and died has shown any signs of tubercular disease, nor has there been any previous case of tuberculosis except those mentioned. The dairy farms from which milk was procured were next investigated. It was found that the first farm from which milk was obtained had a herd of ten or twelve cattle; one of these cows, some time after the milk was obtained for this child, was found to be infected with tuberculosis and was promptly slaughtered. The second dairy from which milk was obtained for a long period is a larger herd, having from forty to sixty cows. Examination of the cattle in June of this year, two months after the death of this child, showed that three cattle showed some symptoms of tuberculosis. They were slaughtered, but none of them were found infected in the slightest degree. All of this would seem to indicate that infection came from the first dairy, and that the child acquired tuberculosis during the third and fourth weeks of its life from this milk.

A few of the interesting points shown by this case are: First, the certainty of primary infection through the intestines, and hence to the peritoneum and the abdominal organs, which, according to Holt, is unusual; second, marked involvement of the pancreas with practical destruction of that organ; third, the progress of the disease clearly shows gravitation toward the lungs. There were one or two small foci found in the upper portion of the lower lobe of the left lung, which seems to indicate that, in an infection of bovine origin, although the disease originates in the abdominal cavity, it nevertheless tends toward development in the pulmonary organs. There was no ulceration of the mucous membrane, which explains, perhaps, the fact that tubercle bacilli were not present in the stools. Most authorities agree that the finding of tubercle bacilli in the stools is the chief point in the positive diagnosis of tuberculosis of the intestines. However, inasmuch as tubercle bacilli are known at the time of infection to pass through normal mucous membrane of the intestine, possibly they may gain exit in the same way.

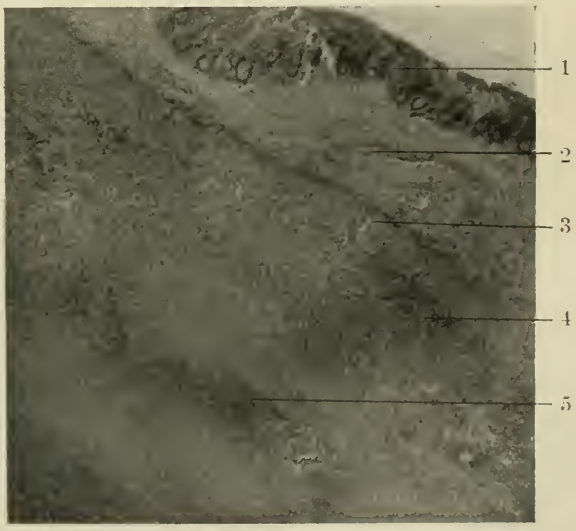
Uffenheimer* describes an interesting case of abdominal tuberculosis in which autopsy revealed findings characteristic of tuberculosis in cattle.

"The patient was a year-old, emaciated, rachitic child, who suffered from obstinate constipation. What first struck the examiner was the large and prominent abdomen, which on percussion was everywhere tympanitic, though palpation revealed a few hard, deep-seated nodules. The liver and spleen were both enlarged. The child died soon after the first examination, with symptoms of tuberculous meningitis. The anatomical findings were as follows: Tuberculosis of the mesenteric glands and peritoneum in the form of 'perlsucht'; miliary tuberculosis of the liver, spleen, lungs, and brain; bronchopneumonia; hydrocephalus; caries of the metacarpus of the left hand."

* Münch. med. Wochschr., July 18, 1905.



Small Intestine. 1, Mucosa, catarrhal. 2, Submucosa, hyperplastic. 3, Int. muscularis slightly infiltrated. 4, Ext. muscularis intensely infiltrated. 5, Serosa and Subserosa, tubercular deposits and necrotic areas.



Small Intestine. 1, Mucosa,—catarrhal atrophy. 2, Submucosa,—hyperplastic. 3, Int. muscularis,—slightly infiltrated. 4, Ext. muscularis,—intensely infiltrated. 5, Serosa and Subserosa,—tubercular deposits and necrotic areas

"The small intestine was dotted with nodules varying from the size of a seed to that of a pea, grayish-red, confluent in some places, and soft. The nodules lay in the submucosa, which was easily separated from the underlying mucous membrane."

"Microscopical examination of the nodules showed a necrotic center containing a few tubercle bacilli, an inner layer of cellular connective tissue, with a few great cells and an outer layer of small round cells. The mesenteric glands were enlarged and caseated."

"The writer believes this to be a case of primary abdominal tuberculosis with secondary lesions in the lungs and other organs. The child's father suffered for many years from pulmonary tuberculosis, and it is likely that milk contaminated by sputum was the source of infection."

In conclusion, it might be asked, Is it possible that the danger from tubercular infection from milk is greater than the supposed or apparent danger which comes from the use of pasteurized or sterilized milk?

Fischer* shows that frequently such foods produce gastro-intestinal derangement. Dyspeptic attacks rob the system of food required for the nutrition of bone, muscle, and other organic structures. When such conditions persist, poor foundations are formed, resulting in rickets or marasmus. The tubercle bacillus easily gains entrance, and secures a foothold that ultimately develops tuberculosis.

Must not our dairies be more carefully inspected? Should not the opposition to the tuberculin test in cattle be overcome? Must not more stringent laws be enacted and enforced with regard to the use of infected meat?

Tuberculose miliaire chez un enfant de 4 mois et demi. Rapport de l'autopsie.—(KOTZ ET GREEN.)

Fille, née décembre 1907. A l'âge de quinze jours, elle a été nourrie de lait de vache; à l'âge de quatre semaines on lui donnait du lait "certifié," modifié pour l'âge. Poids augmentant constamment jusqu'à l'âge de 12 semaines, après quoi diminution graduelle du poids; moyenne de la température à cet âge 99⅖° F., l'abdomen très étendu; mort à 4 mois et ½. Dans les poumons on ne trouva que deux petits nodules; une ou deux glandes médiastinales infectées. La cavité péritonéale était complètement oblitérée, les intestins fortement collés ensemble. Les foyers tuberculeux consistaient d'un tas de tubercules fusionnés en une masse plate jaunâtre, de la grandeur d'une lentille. Dans le pancréas, ces masses étaient nombreuses et avaient modifié complètement cet organe. (Et le pancréas n'est que rarement infecté.) Dans les intestins, les tubercules étaient limités à la couche séreuse et subséreuse et celles-ci étaient occupés entièrement de dépôts tuberculeux. Les couches musculaires et muqueuses étaient atrophiées par une infiltration composée de petites cellules. Les masses tuberculeuses consistaient

* Louis Fischer, M.D., in "Diseases of Infancy and Childhood."

en cellules lymphoïdes et épithéloïdes entourant de petits foyers de nécrose par coagulation, rarement des cellules géantes. Les bacilles de la tuberculose étaient plus abondants dans la couche épithéloïde et à la surface extérieure des foyers nécrotiques. Ils étaient presqu'absents du tissu nécrotique et près des cellules géantes. La plupart des bacilles étaient plus courts, plus gros et les "grains de collier" moins prononcés que dans les bacilles ordinaires trouvés dans le tissu humain.

L'investigation montra que la ferme d'où le premier lait était venu, avait eu une ou deux vaches infectées. Le lait "certifié" provenait de vaches saines ordinaires et soumises à l'inspection; parmi ces dernières, on n'en découvrit aucune qui soit infectée. L'enfant fut probablement infecté pendant sa troisième ou quatrième semaine et d'une façon si violente, que la mort eut lieu trois mois plus tard.

Tuberculosis Miliaria en un niño de cuatro meses y medio de edad. Informe sobre la autopsia.—(Kotz y Green.)

Hembra, nacida en Diciembre de 1907. A la edad de dos semanas se la alimentó con leche de vacas, y á la de cuatro semanas con leche modificada certificada. Ganó con regularidad hasta las doce semanas de edad y después perdió gradualmente; la temperatura media fué de 99⅖°, el abdomen muy distendido; murió á los 4½ meses de edad. Dos pulmones contenían sólo dos nódulos y una ó dos glándulas mediastinales complicadas. La cavidad peritonial estaba obliterada completamente y los intestinos completamente pegados. La fosa tubercular consistía en una masa de tubérculos fundida en una masa plana amarillenta del tamaño de una lenteja. En el pancreas estas masas eran numerosas, desorganizando completamente el órgano. Esta es una condición rara (el pancreas está complicado muy pocas veces). En los intestinos los tubérculos estaban confinados enteramente á las capas serosa y subserosa y estas estaban completamente rellenas de depósitos de tubérculos. El lecho muscular y la mucosa estaban atrofiados con pequeñas infiltraciones de las celdas. Las masas tuberculares consistían de celdas linfoideas y epiteloideas rodeando la fosa menor de coagulación necrosis. Celdas gigantes eran raras. El bacilo tuberculoso era más abundante en el lecho epiteloideo y en la superficie externa de la fosa necrótica. Casi no existán en el tejido necrótico y cerca de la celdas gigantes. La mayor parte de los bacilos eran más cortos, más gruesos y menos unidos unos con otros que los ordinarios que se encuentran en el tejido humano. Las investigaciones demostraron que la hacienda de la cual se obtuvo la primera leche había tenido una ó dos vacas infectadas. La leche certificada venía procedente de ganado ordinario en salud entre el cual no se encontró vaca infectada. La niña se infectó indudablemente durante la tercera y cuarta semanas de vida, y tan violentamente que la muerte ocurrió tres meses más tarde.

CLINICAL MANIFESTATIONS OF TUBERCULOUS MENINGITIS.

By D. J. McCarthy, M.D., and Charles A. Fife, M.D.
Philadelphia.

A study of a large number of cases of tuberculous meningitis reveals not only a wide variation in the pathological findings, but an equally wide variation in the clinical manifestations. These may or may not be dependent upon each other.

Cases of tuberculous meningitis presenting identical lesions at autopsy may have had, during life, an entirely different clinical picture. The converse of this is also sometimes true. If we seek a reason for these variations, we may find it in one or more of several factors. It may depend upon minor changes in the consistency of the exudates, the rapidity in the growth of the tubercles, the grade of the internal hydrocephalus, the presence of mixed infections, and the physical condition of the patient and of the cerebral structures at the time of the development of the meningeal complications.

One of the most important of these is the condition of the patient's brain as a result of long-continued tuberculosis in other viscera, more particularly the lungs. This acts in two ways:

In the first place, long-continued lung disease may be assumed to produce immunity of the structure of the body in such a way as to prevent the implanting of the tubercle bacilli, or if they do obtain a lodgment, to limit their growth.

Secondly, long-continued lung disease may, on the other hand, produce not only a general wasting of the muscular and other tissue, but act in a like way upon the brain.

The presence of large numbers of tubercle bacilli in the urine and feces of dying cases presumes the presence of these bacilli in the general circulation. This is further confirmed by the presence of small tubercles in the liver and kidney in such cases. These tubercles, while present in nearly all dying cases, are localized forms, and do not represent the condition which we usually understand as miliary tubercles. We may therefore assume a certain acquired resistance to the development of a general infection through the blood. Looking at the subject from this view-point, we must consider meningitis complicating advanced pulmonary tuberculosis as an accidental occurrence. This accident may be the result of an embolic infection, such

as occurred in the case of unilateral meningitis reported below. It may, on the other hand, be determined by mixed infection with other organisms. I have seen cases of tuberculous meningitis follow rapidly after a mixed septic infection, and have been able to recover from the meningeal exudate the mixed septic infecting organism. The mixed infection, by lowering the resistance, permits of the infection with the tubercle bacillus. I have known of cases where the same result followed a test injection of tuberculin. One of the cases reported below (H. Z.) would appear to show that traumatism to the head might be a factor.

The brain in cases of marked wasting from long-continued lung disease shows evidence of long-continued loss of tissue in the atrophy of the cortical gyri and the gradual enlargement of the cerebral ventricles. The space in the intracranial cavity thus lost is replaced by a fluid within and without the brain. A very important group of symptoms of tuberculous meningitis is due to the increased intracranial pressure as the result of the distention of the ventricles (acquired acute internal hydrocephalus). The brain at autopsy, where there is no marked wasting, shows evidence of great pressure. The gyri are flattened against the internal wall of the skull, and the ventricles are found distended with fluid. This condition is not always due to the blocking up of the foramen of Magendie and the spaces of Retzius at the base of the brain, but may be ascribed to a disturbance of the circulation of the choroid plexus or an actual inflamed condition of the choroids and the ependyma. In the disturbance of the choroid, the pathological condition may be very intense. In one of the fulminating cases there was hemorrhagic extravasation filling up all the interstices of the structure.

When there is marked atrophy of the brain with a moderate or marked distention of the ventricles, as the result of advanced pulmonary tuberculosis, the relatively increased intracranial area gives sufficient room for any enlargement of the brain due to any inflammatory process of the brain or the ependyma. It is not at all surprising that in such cases a marked disturbance of the consciousness, delirium, headache, optic neuritis, etc., should be slight or entirely absent.

The type of meningitis, and more particularly in reference to its chronicity, must necessarily be a factor in the clinical picture presented. There is a chronic low-grade irritative pathological process present in the meninges of a large percentage of cases dying from advanced pulmonary tuberculosis. This condition is manifested as a distinct roughening of the meninges, a loss of normal luster, and under the microscope a proliferation of the fixed cells of the meninges and a thin layer of fibrin. A low grade of productive meningitis sometimes develops on this basis, and runs a very chronic course with comparatively few of the symptoms of the acute inflammatory types. The following division is therefore suggested:

(A) Cases of tuberculous meningitis which occur as an accidental infection from a primary focus, the bone or the glandular system, while the patient is in relatively good nutrition, before wasting has occurred, and when the system is relatively free from the effects of the tubercle bacillus or the mixed infections.

(B) Wide-spread cases of tuberculous meningitis complicating advanced pulmonary tuberculosis with wasting of the general tissues and associated wasting of the central nervous system.

(C) Cases of tuberculous meningitis complicating pulmonary tuberculosis with mixed infections.

(D) Tuberculous meningitis as a local manifestation of acute miliary tuberculosis.

It is not the purpose of this paper to describe in detail the symptomatology of the common forms of tuberculous meningitis. The clinical picture of a typical case occurring in childhood offers no difficulty in diagnosis. The stage of apathy or invasion, the stage of irritation, the stage of paralysis and coma, together present a sufficiently clear picture, already fully described.

The following irregular forms will alone be considered:

Meningitis as a Local Manifestation of Tuberculous Bacteriemia.

In this form of tuberculous meningitis the symptoms may be entirely masked by a general typhoidal condition due to an intense toxemia, as a result of a blood infection. As in many typhoidal conditions, delirium supervenes early and the headache and irritative symptoms are masked in such a way as to be frequently overlooked. Evidence of internal hydrocephalus is usually present in such cases, and too much attention cannot be paid to irregular fleeting palsies, particularly of the eye muscles. When pressure from hydrocephalus is sufficiently marked, the pupils become widely dilated and blindness supervenes. An ophthalmoscopic examination may show low-grade changes in the optic nerves. Much stress is laid in most textbooks on the presence of miliary tuberculosis of the choroids, but as a matter of practical experience they are of little value on account of their infrequency as clinical phenomena. A diagnosis in such cases can be made only when the physician keeps before him the fact that stuporous conditions and low-grade deliriums complicating tuberculosis should always be considered suspicious of meningeal involvement.

Mixed Tuberculous and Septic Meningitis.

This condition, of relatively rare occurrence in childhood, is of much more frequent occurrence in adult life, and as such is much more likely to complicate pulmonary tuberculosis than either bone or glandular tuberculosis. In these cases the breaking-down of the living tissue is induced by some

saprophytic organism. The mixed infecting agent may act as the determining factor in lowering the resistance of the meninges to the infecting point for the invasion of the tubercle bacillus. The result is a mixed type of meningitis in which there is present not only tubercles, but also a semi-purulent exudate beneath the meninges. The clinical picture presented in such cases is best illustrated by the following case:

E. S., aged sixteen months; parents healthy; paternal grandfather died of tuberculous laryngitis, two paternal uncles died of tuberculous laryngitis, and two paternal uncles of pulmonary tuberculosis. Maternal history negative. Patient was the second child. The first child is now four years of age, and although never very robust, had no severe illness except an attack of gastro-enteritis. At present she shows no signs of tuberculosis.

E. S. was breast-fed for five months; after this with modified milk mixtures. Supply of milk from only two sources. After several months' feeding from first supply, milk was suspected and examined. It was found to contain saltpetre. Second supply was from small dairy farm which was not under any special governmental or society regulation.

The child was strong and active until the eleventh month, when she developed bilateral tonsillitis, followed by bilateral cervical adenitis. The glands, however, did not break down, but in six weeks were so much reduced that they became scarcely palpable. The tonsillitis was associated with a moderate bronchitis. The lungs on careful examination gave no evidence of tuberculosis. A mild grade of gastro-enteritis was, however, present. During the attack the range of temperature was high, reaching 104°, and the leukocytes were 22,000. Recovery was slow, but within six weeks the child seemed to be in normal condition.

About the first of July the child had a mild attack of gastro-enteritis, with a slow convalescence; in fact, she never regained her former health, although the stools became normal in number and character.

There was no eruption of teeth until the eleventh month (at the time of the attack of tonsillitis, etc.), when four teeth appeared; then not again until the attack of gastro-enteritis in July (fifteenth month), when there was an eruption of two more teeth. About the 5th of August the gums again became sore, and there was a third attack of enteritis, which, however, was not of a grave nature, only three or four movements a day, containing small curds and mucus, of a greenish color, but very offensive odor. Temperature was about 100° in the evenings and normal in the mornings. The child seemed bright, had a fairly good appetite, but lost in weight. She had no cough, and although the intestinal condition apparently soon became normal, her general condition did not greatly improve. There was continuous loss of weight, and a rise of temperature during the afternoon. About the 1st of August the digestive symptoms again became pronounced, there was some vomiting, diarrhea, flatulency. The child became peevish and restless, and she cut another tooth. Frequent examination of the chest, throat, and abdomen revealed nothing. Joints negative, no symptoms of brain or spinal cord disease, ears and eyes negative, no ophthalmological examination. Fever continued; leukocyte count made about this time was 10,250. Differential count showed nothing abnormal. Stools gave evidence of fat indigestion.

No tubercle bacilli found, although several examinations of the stools were made. Widal test was negative. About the 18th of August the spleen became easily palpable, but remained so only about a week, the Widal test remaining negative. Von Pirquet test also negative.

August 18th the child began to be slightly drowsy, the drowsiness increasing until the 27th, when the stupor was complete. There was no rigidity until the 27th, and then only evident in the neck. There was no symptom referable to the cranial nerves until the 30th, when the pupils showed a slight inequality, and a slight strabismus of the right eye was present for one day. There was less motion of left arm and leg than of right extremities. The child continued to swallow well until the evening of the 31st. Kernig's sign was present after the 30th, but not marked. Vasomotor instability present after the 29th. Vomiting was not present during the entire illness except on two occasions, and then was not marked nor of the cerebral type. The abdomen was not only not contracted, but was very flaccid. The left kidney seemed slightly larger than the right, and at one examination was larger than at any other time. Frequent examinations of the urine were made, and although a few leukocytes were found, no intermittent discharge of pus could be detected. Left pyelonephrosis was suspected.

The temperature was of the septic type during the last two weeks of life, was invariably high in the afternoons, and on the last day of life reached 107°. Pulse was not irregular, full and strong, average rate of about 120. Respiration became irregular, approaching the Cheyne-Stokes type, about the 27th of August. During the last four days of life the child had general convulsions (rather distinct twitchings whenever disturbed), more marked on the right side. Death occurred on the 2d of September. Lumbar puncture was performed twice. Two fluidounces of clear fluid were obtained. No tubercle bacille found in fluid. Lymphocytes predominated. Cerebral symptoms were not relieved by "puncture."

Autopsy showed the body of a child of poor nutrition, with poor musculature and a very small amount of superficial fat. The pupils were equal and dilated, and there were marks of spinal puncture in the lumbar region. The peritoneal adipose tissue is diminished; the abdominal thoracic muscles poorly developed. The relative position of the abdominal, thoracic, and pelvic viscera was normal. The lymphatic glands were not palpable.

Left lung: The pleura covering the left lung was perfectly normal. The left lung was air-bearing, and on section small miliary tubercles were seen scattered throughout. These tubercles were pinhead in size, isolated, and located in air-bearing tissue. There was no coalescence of tubercles and no evidence of tuberculous caseation or pneumonia.

Right lung: On the right side the pleura was normal with the exception of an area, irregularly circular, 4 cm. in diameter on the upper third of the posterior portion of the upper lobe. In this location the pleura was adherent. The adhesions were firm and showed some induration. The section of the lung showed a cavity 2 by 3 cm. immediately beneath the surface, corresponding to the area of pleural adhesion. The walls of this cavity were smooth. The cavity was empty. There was no evidence of tuberculous infiltration surrounding this cavity, except toward the root of the lung. A column of tuberculous infiltration with caseation, 0.5 cm. in diameter,

extended from this cavity to the root of the lung. In the mediastinal space to this position several enlarged peribronchial glands were observed. These were relatively of hard consistence, yellow in color, but revealed no caseation. The rest of the right lung was air-bearing, but contained, like the left, scattered isolated miliary tubercles the size of a pinhead. The liver contained large numbers of isolated miliary tubercles the size of a pinhead. The heart and pericardium were normal. The spleen was slightly enlarged and slightly softer than normal. It contained large numbers of isolated miliary tubercles 0.5 mm. in diameter. The kidneys were larger than normal, swollen, and brownish-yellow in color. The left ureter contained a purulent fluid. The mucous membrane of the pelvis of the left kidney was thickened and somewhat injected. The bladder was distended with clear fluid, but was otherwise normal. The mesenteric glands were enlarged and congested, varying in size from 2 mm. to 2 cm. in diameter. In one group the mesenteric glands were not only enlarged, but were yellow in appearance and showed on section extensive caseation. The retroperitoneal glands showed no evidence of tuberculosis.

There was a large quantity of turbid fluid at the base of the brain and in the ventricles. The convolutions were swollen and flattened against the dura. The inner surface of the dura was smooth. There was no evidence of inflammatory process except around the foramen of Magendie. The convex surface of the brain was anemic, the base markedly congested, especially the base of the frontal lobe, the posterior surface of which was covered over with thick seroplastic exudate. This extended into the fissure of Sylvius on either side, and over the frontal lobe, matting everything together from the optic commissure to the medulla. At the base of the frontal lobe anteriorly were many scattered, yellowish, gelatinous, white tubercles, and in fairly large numbers along the vessels on the lateral surface of the frontal and temporosphenoidal lobes. No isolated tubercles were to be seen on the above-mentioned exudate, even on the vellum interpositum, but were to be seen on the choroid plexus. Cerebellum was perfectly clear. There were no tubercles. There were relatively few tubercles on the convexity.

Microscopical Examination.—Right lung: Sections through the cavity showed, in the immediate neighborhood of the cavity wall, a few coalescing tubercles of typical appearance; there was marked distention of the blood-vessels and the presence of some free blood in the tissues. The peribronchial glands showed marked fibrosis at the periphery and caseating tubercles in the center of the gland. The kidneys showed a marked grade of parenchymatous nephritis. Tubercles were not seen in the sections. The brain showed a productive type of leptomeningitis on the convexity, with isolated miliary tubercles here and there, and an extensive seroplastic tuberculosis at the base of the brain, with large areas of caseating tubercles. Both processes indicated a chronic subacute process, the more chronic of these being on the convexity.

This case appears to us to be worthy of record on account of the possible intestinal source of infection, the presence of cavity formation evidently of some standing, in the lungs of the child, the rather chronic type of tuberculous meningitis, and the problem of diagnosis of tuberculous meningitis

with comparatively few symptoms relative to the nervous system and no symptoms at all referable to the pulmonary system, and with evidence of a pyelonephritis. From a clinical standpoint, the patient did not at any time present symptoms of tuberculosis. There was no cough, no dyspnea, and only the general wasting, which might be attributed to the complicating kidney condition. Until two days before death, there was no suspicion of a tuberculous meningitis.

The microscopical examination showed that the meningeal process must have existed for some time. Judging from experience with the histological pictures of other cases, it must have been a matter of several weeks. The child showed some irritability, but no more than that seen in teething children. There was some stupor for seven or eight days preceding death. This was not of considerable importance on account of the weakened, wasted condition of the child. The temperature was of a septic type; the pulse-rate was high, contrary to the general rule. The patient was seen by three prominent specialists in children's diseases, who after a careful examination did not suspect either the pulmonary or the nervous condition.

The explanation of the lack of symptoms referable to the nervous system, not only in this but in other cases, will receive much fuller consideration in another paper presented, by one of us (D. J. M.), in this Section of the Congress. It is, however, worth while to call attention to the fact that active types of tuberculous meningitis may run a much longer course with the symptoms referable to the nervous system entirely masked, where pulmonary or other septic complicating conditions exist. It is questionable whether in this case it was possible to make a diagnosis of tuberculous meningitis before the development of convulsions, immediately before death, and more particularly when the diagnosis of miliary tuberculosis was not made. There is no question, in view of the autopsy findings, that the pulmonary condition should have been diagnosed by a careful examination, and yet this was entirely overlooked by specialists of high repute, who examined the lungs. If this diagnosis had been made, the general rule which experience has taught us, that a progressively, deepening stupor, complicating tuberculosis of the lungs or other viscera should suggest tuberculous meningitis, even in the absence of all other symptoms, would probably have led to a proper conclusion.

One of the above cases at the Phipps Institute, No. 3152, although under careful observation of several physicians, did not present at any time any symptoms of meningitis. He was a case of advanced pulmonary tuberculosis with laryngeal involvement. There was intense dyspnea for some time before death. The patient at no time complained of headache, did not present contraction of the neck or cranial nerve palsies, and yet at autopsy there was an extensive productive type of meningitis, not only at the base

of the brain, but extending over the convexity. Between the gyri there was a large number of cells of spindle type with elliptical nuclei with some round cells. There were no distinct localized tubercles in this case, and no exudate over the base of the brain other than the subacute leptomeningeal irritation above noted.

A probable example of the healing type of cases was that of a girl which occurred at the Philadelphia Hospital. This case was as follows:

B. J., female, aged forty-six; color, black; birthplace, North Carolina; occupation, housework. Admitted to the Philadelphia Hospital, August 18, 1908.

Patient was in a semistuporous condition, unable to answer questions intelligently; so no subjective test could be obtained. A well-developed, fairly well-nourished adult negro female.

Expression is vacant and distant. Divergent strabismus, amaurosis. Pupils are unequal, the left measuring 4 mm. and the right 3 mm. They are irregular to a marked degree and react very slightly and sluggishly to light, accommodation, and convergence. Eye-grounds were reported negative by chief.

Tongue dry, coated, protrudes centrally and shows tremor. There is a foul odor on the breath.

Pulse is rapid, low volume, and tension regular and synchronous.

Head is retracted and rigid. The muscles of the back of the neck are very rigid. There are slight convulsive contractures, clonic in type, in all parts of the body.

Chest is emaciated, supraclavicular and infraclavicular fossæ, and interspaces are prominent. The chest movements are very shallow and equal. There is impairment of resonance in the first and second interspaces anteriorly, with greatly roughened breath sounds and some increase in vocal and tactile fremitus. The area of cardiac dullness is increased to right and to left. It extends to the midsternal line to a point $\frac{1}{4}$ to the right of the nipple line. There is a rough, harsh, presystolic murmur heard at the apex and not transmitted. There is a distinct thrill at the apex. Myocardial tone fair. A distinct "bucket sound" is heard over the aortic area.

Abdomen is hard and tense and shows some tympanites. Organs appear normal.

Glands: The inguinal glands are moderately enlarged, but the cervical glands are very markedly enlarged.

Extremities show scars which are suspicious of syphilis.

Muscles are well developed and show no atrophy. Fibrillary tremors are seen, with restlessness, rigidity of the muscles of the neck, and in the back.

Reflexes are uniformly increased; most marked, however, on the left side. There is retraction to plantar irritation on the left; slight flexion on the right. There is no patellar or ankle clonus. Kernig's sign is marked on both sides. Test for sight reveals almost complete loss of sight. Eye muscles cannot be tested.

Examination of cerebrospinal fluid: 8 : 21 : '08. Tubercle bacilli were present, a few lymphocytes and a few polynuclears.

9 : 22 : '08. Cerebrospinal fluid acellular and contains no tubercle bacilli.

The temperature at first was subnormal, but at times was elevated as high as 99.4°. The pulse ranged between 90 and 100, but was on occasions as high as 120. The respiratory rate was somewhat elevated, varying through periods of irritation between 25 and 30.

9 : 1 : '08. Patient is clearing up. Eyesight is better, but only recognizes large objects. Mental condition is clearer. Kernig's sign is still present. Rigidity of the neck has largely disappeared.

9 : 4 : '08. Patient is much better this morning, generally.

9 : 5 : '08. All meningeal troubles have disappeared.

9 : 11 : '08. Patient is much better, but is very noisy and calls out very loudly about all sorts of topics relating to the Bible.

9 : 12 : '09. A condition of acute religious mania obtains; no symptoms of meningitis.

A patient presenting a progressive low type of tuberculous infection of the lungs gradually manifests, together with wasting and cough, a higher and more irregular temperature, with evidence of some septic infection. The pulse-rate is much more rapid than is to be expected in tuberculosis of the meninges at this stage, and little attention is paid to a slowly progressing stupor on account of the illness of the child. The exudate which is formed at the base of the brain in these cases is not of that firm consistency which is seen in productive types of meningitis, but is of a looser semipurulent type, which produces relatively little damage by pressure, and to which the cranial nerves offer more resistance than would be expected. Cranial nerve palsies, if they occur, are of a very fleeting type, and if observed are usually attributed to other causes. Rigidity of the muscles of the neck and Kernig's sign may not be well developed and may only occur late in the course of the disease.

Localized Forms of Meningitis.

Various forms of meningitis localized to certain definite areas of the brain may occur and give rise to certain definite groups of symptoms extremely puzzling, if the pathology is not carefully studied. In my own collection I have cases of acute tuberculous meningitis localized (*a*) to the mesial surface of the brain; (*b*) to the posterior fossæ; (*c*) to one cerebral hemisphere; (*d*) to a localized area on the frontal lobe; and (*e*) a large group of cases of a very peculiar nature, showing irregular areas of hemorrhagic softening, most frequently combined at the base of the frontal and temporosphenoidal lobes, which cannot, in the ordinary sense of the term, be considered tuberculous, but which complicate pulmonary tuberculosis. This latter group of cases has been dealt with from the pathological standpoint in another paper; the clinical manifestations have not been sufficiently well worked out as to be of much diagnostic value. Some of the cases have, however, been found associated with certain mental changes, and may stand in some causative relation to such symptoms.

The localized forms of active tuberculous meningitis may be diagnosed by careful attention to the mode of onset and the symptoms of localization. As an example of this, the case of unilateral tuberculous meningitis limited to one hemisphere, above noted, was of sudden onset, with irritative symptoms (convulsions) localized to the right side of the body, without loss of consciousness, and followed by paralysis limited to one side of the body. Inasmuch as it complicated advanced pulmonary tuberculosis, a diagnosis of unilateral tuberculous meningitis was the only logical interpretation of the symptom-complex.

In a case of Frentzel's the tuberculosis was limited to the choroid plexus. Repeated spells of unconsciousness, with contractions of the facial muscles, and death in thirty hours were the only symptoms.

In tuberculosis of the posterior fossæ, the predominance of irritative symptoms referred to the cerebellum, marked retraction of the head, with persistent headaches, but without evidence of internal hydrocephalus, ought to make a presumptive diagnosis.

In the case of tuberculosis restricted to the mesial surface of the brain, the symptoms were very meager. The pupils were unequal, the left large and almost twice the size of the right. Both reacted to light and convergence. There was a slight tremor of the hands, which became more accentuated, and shortly before death became localized to the right arm and leg and resembled that seen in paralysis agitans. The muscular power was fair for one suffering from advanced pulmonary tuberculosis, and reflex activity in all the extremities was present. The Babinski reflex (extension of the toes to plantar irritation) was present on the right side and absent on the left. The same was true of the Gordon paradoxical phenomenon. The patient showed a marked failure of memory, but consciousness was preserved until shortly before death, when terminal delirium supervened. The only symptoms on which a diagnosis of tuberculous meningitis could be made in this case were inequality of the pupils, evidence of perverted motor function, the tremor of one side of the body, and the Babinski reflex.

Whether tuberculous meningitis ever goes on to healing or not has been a much mooted question. One can see no reason, from a pathological standpoint, why certain localized forms should not get well. Tuberculous meningitis from a pathological standpoint shows a very varying picture. The fulminating cases may terminate fatally in as short a period as three days, but other cases may be prolonged for weeks. In the acute fulminating forms extravasating hemorrhage is not at all an infrequent condition. In one of the cases in my collection extensive hemorrhages were present not only in the pons and basal ganglia, but also filled up the choroid plexuses and the interstices of the lateral ventricles. In the more chronic types the type of cell formation is such as to lead us to the conclusion that we

are dealing with intermediate forms between an acute inflammatory process and a low-grade proliferative process. The symptomatology in this latter group is quite different from that of the acute type. Such an important symptom as headache may be entirely absent. It may, however, be the only symptom. The temperature in these cases is only slightly elevated, ranging from 99° to 100°, with a terminal rise to a much higher grade. Where the productive changes are wide-spread, irritative symptoms, such as muscular twitchings and vasomotor disturbances, may occur. Symptoms referred to disturbance of function of the cranial nerves may be entirely absent. The diagnosis in such cases not infrequently remains in doubt until the termination of the case. It is to be remembered that the process in such cases is a diffuse infiltrating process which can be readily overlooked at autopsy because of the absence of isolated tubercles. The diagnosis is often in doubt until the microscopical examination has been made.

In one of the cases above referred to under localized meningitis, large numbers of small tubercles composed of a spindle type of cell and without evidence of inflammatory reaction in the surrounding meninges, may well be considered as a healing type. We are certainly not justified in calling this a healed case of meningitis, because there was no inflammation in the true sense of the term. As a healed process, all that would have remained would have been a few pinpoint white nodules on the meninges, which have been observed at times at autopsy, but which, on account of there being no evidence as to their tuberculous nature, are usually not considered as such.

Traumatism and Tuberculous Meningitis.

A subject not only of clinical importance, but also of distinct medico-legal value, is that group of cases in which the tuberculous meningitis follows immediately on some injury to the head. The following case will illustrate the importance of this subject:

H. Z., aged twenty-one; color, white; birthplace, Poland; occupation, longshoreman.

Admitted to the hospital, August 23, 1908. Died, September 11, 1908. On admission had nausea, vomiting, anorexia, severe headache which is constant, drowsiness which frequently deepens into stupor, and a feeling of general weakness.

On Sunday, August 14, 1908, as the patient was at work in a dock, a large iron hook, six inches in length and as thick as one's wrist, was swung against him, striking him in the right parieto-temporal region. The blow merely stunned him and he did not become unconscious, but continued to attend to his duties throughout that day, suffering only from a severe headache. He worked the next day, and the following day, Wednesday, August 17, 1908, when he commenced vomiting, and the headache became more

severe. In a few days he became drowsy. This gradually deepened into stupor, and the patient has remained in this condition ever since.

The patient states that on Wednesday, three days after the accident, he took a drink of water, and immediately found that he could not use the right arm and leg. On examination of the right upper and lower extremities, power is found to be very good. They are just as strong as those of the opposite side. There is no evidence whatever of hemiplegia.

Patient is of medium height, well nourished, and very well developed muscularly.

He is in a condition of stupor. When spoken to he pays no attention unless the question is repeated and he is aroused, when he will give a monosyllabic reply. He lies quietly, takes nourishment well, and has had no convulsions since coming into the ward. On examination of the head, a slight depression is noted in the right temporo-frontal region. There is no abrasion such as would come from blunt force, and on careful examination it is found to be in all probability a normal depression. The one on the other side corresponds, but is not quite so marked.

The eyes react to light and appear to react to accommodation. Convergence is good. Extraocular movements are normal. There is no exophthalmus in either eye. Sclera, cornea, etc., appear to be in good condition.

Nose and throat are negative. Tongue is protruded centrally, is clean and free from tremor.

Pulse is very slow, being about 50 to 54 beats per minute. Volume and tension are rather poor and the pulsations are slightly irregular. Radials beat synchronously. There appears to be a slight arteriosclerosis present.

Friction rub is heard over the upper portion of the left lung anterolaterally. Impaired resonance is present in the left apex.

Heart action is regular, of good myocardial tone, but is slow. No murmurs are present. Abdomen and internal organs are apparently normal. The spine is apparently normal. A hydrocele is present on the left side of the scrotum. It is about the size of an orange.

8 :26 :'08. Examination of the eyes shows the presence of a neuroretinitis with marked congestion of the veins. There is slight swelling of the disk, more marked on the right side. Pupils react to light, accommodation, and convergence. Extraocular movements are good. No loss of power or ataxia of arms is present. Muscular power, flexion, and extension are good. There is no ankle clonus; knee-jerks are normal; if anything, diminished. Achilles jerk is normal on both sides. There is flexion of toes to plantar irritation on both sides. Sensation is retained to both pain and touch. The cranial nerves, with the exception of the second, appear to be normal. Biceps jerks are normal. There is a well-developed Kernig's sign on the left side. There is a slight Kernig's sign on the right side. Patient complains of pain in the neck when head is extended. Slight rigidity of the neck is present. On the lower extremities there is a purplish mottling, probably vasomotor in character. (Examination on a cold, damp day.) The same is true of the arms, which are warm. There is a slight Gordon paradoxical phenomenon on the left side, questionable on the right. There is tenderness on the frontal area over right eye. *x*-Ray examination shows a depressed fracture of external table of skull in right fronto-parietal area.

9 :2 :'08. Friction rub is heard over upper portion of the left lung antero-

laterally. Impaired resonance is present in apex of left lung. There is bronchial breathing to second interspace and to spine of scapula. Whistling pectoriloquy at apex.

9 : 3 : '08. Patient seems to be in more stupid condition than he was yesterday. Friction rub is still heard. There are no râles. Heart action is regular, but slightly slower than normal.

9 : 4 : '08. Patient's mental condition is unchanged this A.M. Friction rub is greatly diminished. There are no râles. Heart action is still regular and slightly slowed.

Urine report: Amber yellow in color, slight sediment, alkaline in reaction. Sp. gr. 1020. No albumin present. Microscopical examination: There were triple phosphate crystals, urates, few calcium oxalates, and a number of epithelial cells.

Eye report by Dr. Halloway: 9 : 2 : '08: Right pupil is slightly larger than the left; both respond to light and convergence. Ocular movements, as far as can be determined, are 9000. Right: No change in the media, the disk is slightly oval with blurred edges most marked above and below; the veins show some overfilling; there is no evidence of light spot over disk. There is no change in choroid or retina. Left: There is no change in the media; disk is practically oval, with distinct blurring of the upper and lower margins, the nasal and temporal margins being much more distinct. Down and out along the inferior temporal vessels is a vague and poorly defined pigment patch, which is probably congenital. Diagnosis: Beginning optic neuritis, slightly more marked on the right side.

The patient was transferred to the surgical department September 3, 1908. An osteoplastic flap was made on the left side over the seat of the injury and the area of bone depression as indicated by the *x*-ray examination. There was no depression fracture found on examination of the bone, and the brain showed evidence of marked active congestion, was markedly swollen, and the meninges were dull and lusterless. The lateral ventricle on the left side was tapped and considerable cloudy fluid evacuated. This led to a decrease of the swelling. The patient recovered from the operation, but remained in the same condition of semistupor, which gradually became deeper from day to day until death supervened on September 11, 1908. Shortly after the operation a hemiplegia developed on the left side, which was probably due to the pressure of the swollen brain against the margin of the operation area (posterior edge of the osteoplastic flap corresponding to the Rolandic area).

The autopsy showed an extensive tuberculous meningitis of seroplastic type. This was very extensive over the base and almost as extensive over the convexity, more particularly along the margin of the cerebral hemispheres. Isolated tubercles were scattered along the vessels on the external surface of the hemispheres.

In the above case there was every reason to believe that the symptoms were due to traumatism. The symptoms do not, however, conform to those of cerebral hemorrhage or cerebral concussion. There were no symptoms in this case referred to the cranial nerves, with the exception of changes in the eye-grounds. There were no tubercle bacilli in the cerebrospinal fluid.

There was, however, evidence of meningeal irritation and rigidity of the neck, with a well-developed Kernig's symptom, and the presence of a tuberculosis of the left lung led me to make a diagnosis of tuberculous meningitis, but it did not seem justifiable to refuse an operation with an evidence of external injury to the skull and the evidence of a depressed fracture of the skull at the point of injury. This decision was made on account of the hopeless nature of the diagnosis of tuberculous meningitis and the possibility of good from an extensive decompression operation.

The purpose of this paper is to call attention to the fact that the diagnosis of tuberculous meningitis must necessarily and primarily rest on the discovery of the source of infection. This necessarily entails an examination of the entire body, and more particularly of the lungs. While lumbar puncture has its value, it cannot be too much relied upon in the reports from the laboratories of large hospitals. In the last case above quoted, the report was negative; the diagnosis was only made by careful attention to the physical signs in the chest.

It should be remembered that tuberculous meningitis complicating pulmonary tuberculosis may be very extensive and yet present few physical signs. I have known cases that presented no other symptons than headache, mental tardiness, and the Babinski or Gordon phenomenon. In other words, the diagnosis of tuberculous meningitis does not depend upon a multiplicity of symptoms, following the lines of the classical cases reported in text-books, but on a careful study of few or many adventitious symptoms, in the course of a glandular or pulmonary tuberculosis. A knowledge of the pathology of tuberculosis of the meninges and its relation to tuberculosis, in general, an open mind for symptoms referable to the nervous system, and some experience with the varying types as presented clinically, would mean more in the diagnosis than the evidence to be derived from a text-book or the microscope; not that the latter is to be neglected, but it is not to be overvalued.

Las Manifestaciones Clinicas de la Meningitis Tuberculosa.

Tuberculosis Miliar con Meningitis Tuberculosa en un Niño de 17 Meses de Edad.—(McCarthy y Fife.)

La meningitis tuberculosa como una manifestacion local de la bacteremia tuberculosa.

Paralisis transitoria irregular, especialmente de los musculos del ojo, ceguedad y dilatacion de la pupila debido al hidrocefalos interno, estupor y delirio ayuda en la distincion de estos casos.

La tuberculosis de niños ó infeccion septica. La afeccion de los nervios craneales en este caso es muy limitada, mas la rapidez del pulso se aumenta.

Meningitis tuberculosa localizada: esta debe distinguirse de los sintomas localizados de la tuberculosis pulmonar.

Tipos productivos y cicatrizantes que demuestran pathologicamente tuberculos con celulas de tipo huso. Casos fulminantes de hemorragia.

Casos asociados con tromatismo. Estos ultimos son de gran importancia en la Medicina Legal.

El objeto de este articulo es llamar la atencion al hecho de que el origen de la infeccion debe ser descubierta y el diagnostico del laboratorio valuarlo como secundario en importancia.

Este caso es de un niño de 17 meses de edad en el cual se presentó un ataque inicial de tonsilitis poco despues del nacimiento. Este fue seguido por una infeccion gastro intestinal con agrandamiento del bazo.

Los sintomas clinicos principales fueron entorpecimiento, estupor, paralises nerviosa, contracciones faciales, rigidez de las extremidades y ataques convulsivos.

En la autopsia se encontró una tuberculosis miliar muy extendida en todos los organos del cuerpo. La fuente de esta infeccion fue una cavidad en el vertice del pulmon. En este lugar se encontró una cavidad como de dos centimetros de diámetro con una area de degeneration caseosa que se extendía desde esta cavidad al asiento del pulmon derecho. Las glandulas peri-bronquiales se encontraron agrandadas y con una degeneracion caseosa. Este caso parece ser uno de infeccion intestinal con una afeccion secundaria del pulmon con una tuberculosis miliar primaria y meningitis tuberculosa secondaria.

Manifestations cliniques de Méningite tuberculeuse.

Tuberculose miliare avec la Méningite tuberculeuse chez un Enfant de 17 Semaines.—(McCarthy et Fife.)

Les types suivants de cas atypiques seront considérés:

La méningite tuberculeuse comme manifestation locale de le bactérémia tuberculeuse.

Des paralysies irrégulières, passagères spécialement des muscles des yeux, cécité et dilatation des pupilles dues à une hydrocéphalie interne, stupeur et delirium permettent de discerner ce type.

La tuberculose des mineurs et l'infection septique. L'embarras du nerf crânien est dans ce cas très limité, mais le pouls peut être plus fréquent.

La méningite tuberculeuse, localisée celle-ci doit être discernée par le symptôme localisé dans un cas de tuberculose pulmonaire.

Des types en cours de maladie et des types en train de guérir montrent

au point de vue pathologique de petits tubercules avec des cellules à forme de fuseau, des cas extrêmes avec hémorragie.

Des cas associés au traumatisme; ces derniers sont de valeur médico-légale considérable.

Le but de cette communication est d'appeler l'attention sur le fait qu'il faut découvrir la source de l'infection et que le diagnostic du laboratoire doit être considéré comme de valeur secondaire.

Ce cas est celui d'un enfant de 17 semaines qui fut atteint d'une attaque initiale d'amygdalite (ou angine) peu après sa naissance, suivie d'infection gastro-intestinale avec élargissement de la rate.

Les symptômes cliniques furent: assoupissement, stupeur, paralysie passagère du troisième nerf, contortions faciales, rigidité des extrémités et attaques de convulsions.

L'autopsie a révélé une tuberculose miliaire très-étendue, affectant tous les organes du corps. La source de l'infection, selon toute probabilité, était une vieille lésion au sommet du poumon droit; à ce point, il y avait une cavité de 2 cm. de diamètre avec une surface de dégénérescence caséeuse s'étendant de cette cavité à la base du poumon droit. Les glandes péribronchiales étaient agrandies et caséeuses. Les glandes mésentériques étaient également agrandies et la base en état de dégénérescence caséeuse. Ce cas semble être un cas d'infection intestinale avec implication secondaire du poumon par une tuberculose miliaire primaire et une méningite tuberculeuse secondaire.

Die klinischen Erscheinungen der tuberkulösen Gehirnhaut-Entzündung.

Miliartuberculose, associirt mit tuberculöser Meningitis in einem 17 Wochen alten Säuglinge.—(McCarthy und Fife.)

Folgende atypische Formen sollen Besprechung finden:

Meningitis tuberculosa als Lokalmanifestation einer tuberkulösen Bakterämie.

Unregelmässige flüchtige Lähmungen, namentlich der Augenmuskeln, Erblindung und Dilatation der Pupillen durch Hydrocephalus internus, Stupor und Delirium sind charakteristische Anzeichen.

Tuberkulose und septische Infektion: die Cranialnerven sind hier wenig in Mitleidenschaft gezogen; der Pulsschlag ist gewöhnlich rapid.

Lokalisirte tuberkulöse Meningitis: gekennzeichnet durch Lokalsymptome in einem Falle von Lungentuberkulose.

Produktive und heilungsfähige Typen, die pathologisch keine Tuberkel mit spindelförmigen Zellen aufweisen. Foudroyante Typen mit Blutungen.

Fälle infolge von Traumatismus, bedeutenden forensisch-medizinischen Werth besitzend.

Die Arbeit bezweckt, darauf hinzuweisen, dass vor allem die Quelle der Infektion zu eruiren sei und die Laboratorium-Diagnose erst in zweiter Reihe in Betracht komme.

Kurz nach der Geburt war bei dem 17 Wochen alten Kinde eine Tonsillitis aufgetreten. In der Folge hatte sich dann eine Gastrointestinal-Infection mit Milzschwellung entwickelt.

Die markantesten klinischen Anzeichen waren Benommenheit, Stupor, vorübergehende Lähmung des dritten Nerven. Gesichts-Zuckungen, Rigidität der Extremitäten und Convulsionen.

Die Autopsie ergab eine extensive Miliartuberkulose, die sich auf sämmtliche Organe erstreckte. Die Infectionsquelle war anscheinend eine alte Läsion im rechten Lungenspitz. Hier befand sich eine Caverne von 2 cm. Durchmesser, von der sich die käsige Degeneration über die rechte Lunge verbreitet hatte. Die Peribronchial-Drüsen waren geschwollen und käsig verartet, ebenso die Mesenterialdrüsen. Es scheint dies ein Fall von Intestinal-Infection zu sein, dem sich eine primäre Miliartuberkulose und secundäre Meningealtuberculose angereiht hatte.

DISCUSSION.

Dr. Lawrence Litchfield (Pittsburg) furnished the following history:

Patient, R. W. S. Born January 27, 1907. White. First and only child. Full term; natural delivery, not prolonged, no instruments used. Head always large, but well formed. Child bright, but not precocious. Veins in face and scalp never conspicuous. Face well proportioned.

In November, 1907, had a slight illness attributed to indigestion, temperature going up to 104°; vomiting at onset, followed by drowsiness. Physical examination negative. Rapid return to normal health and strength. During the spring of 1908 his development was normal, flesh firm, and color good. Was considered an exceptionally strong and healthy child.

In May, 1908, he became fretful, peevish, and his appetite became capricious. About the 22d of May some temperature was noticed, and he began to vomit his food. He had sixteen teeth, and the other four seemed to be rapidly developing. Had been walking for several months, I think. Physical examination negative. No cough, no cold. Ear-drums both normal.

June 3d: Condition much the same; patient irritable, cries in a whining manner frequently; sleeps well at night; appetite poor; bowel movements frequent, mucus in stools; temperature, 102.3°.

June 8th: Condition remained much the same until yesterday. To-day temperature 100°; pupils widely dilated, eyes turned up and to left; reflexes increased; crying the same; bowel movements still frequent and contain mucus.

June 9th: Had several slight convulsions during the night, and severe

one about 9 A.M., and again at 10 and 10.30. Unconscious for a while, but brightened up, recognizing parents. Left ear-drum very slightly congested; drum punctured, with the escape of a little clear serum.

June 10th: Convulsions continued at more or less frequent intervals; between them, left arm rather limp.

June 11th: Slight convulsions, twitching of right hand. Temperature normal for two days; pulse 88, good quality; patient taking nourishment better.

June 12th: Temperature normal all day yesterday. Pulse 88, good quality; slight discharge from left ear. Eight to ten convulsions yesterday involving arms, right leg, left side of face. To-day hemoglobin 65 per cent.; leukocytes, 13,500. Lumbar puncture is done; eight to ten minims of clear fluid obtained, containing a few red blood-corpuscles, few very large and few very small mononuclear leukocytes or endothelial cells, no organisms.

June 13th: Area of clearly defined marked dullness discovered over left parietal region just above the ear. Operation decided upon and done. Bone flap made, meninges exposed, slightly congested and bulging. Left ventricle punctured, with the escape of a number of ounces of clear, straw-colored fluid, which later on was found to contain a few red blood-corpuscles, very few leukocytes, and no organisms. Child survived thirty-six hours; convulsions, which had been half hourly just before operation, did not return, but there was some nervous twitching during the night, and occasional rigidity in early morning, and again the following morning just before death.

Post-mortem: With exception of dilated ventricles, and flattening of the convolutions, no gross lesions were discovered.

Pathological Report by Dr. E. W. Willetts: Several pieces of brain tissue preserved in weak formaldehyd solution. Gross examination: ventricular surface showed a number of small nodules, size of a pinhead, on the surface of the lining of the ventricle. Sections through these small masses, on staining, consisted of large cells with reticulated nuclei staining poorly. Scattered around these were a few small round cells with fibrous stroma supporting them. There were no giant-cells. Beneath the ependyma were a number of smaller collections of similar cells, apparently miliary tubercles. Brain cells stained poorly. There is no suggestion of inflammation. The convexity of the brain and the pia showed no evidence of inflammation. Stain negative for tubercle bacilli. Delafield and Prudden show similar picture of acute internal hydrocephalus. There was no caseation.

At the time of the patient's illness there was not known to be any case of tuberculosis in the family. When the baby was about eight months old, his father had an acute illness with high fever, headache, etc., for several days. Two months later he had a similar attack and was confined to his bed about two weeks. The lungs were carefully examined, with negative results. His lungs were again examined in February, 1908, and pronounced normal. He was noted at this time to have a rather rapid pulse, and on several occasions one or two degrees of temperature. In August, 1908, he came to my office again complaining of cold in the head with cough, hoarseness, and expectoration. No night-sweats, or loss of weight. Physical examination showed signs of slight consolidation at the left apex; and the sputum was streaked with blood and contained many tubercle bacilli. Temperature taken carefully for several days showed no evening rise.

THE LOCALIZATION OF TUBERCULOSIS IN CHILDREN.

By Woods Hutchinson, A.M., M.D.,
New York.

While our knowledge of this subject is fairly extensive, our ignorance is equally so, and far more profound. We are more deeply impressed with what we do not know about it than we were twenty years ago. The principal purpose of this communication is to call attention to the gaps in our knowledge, and to suggest lines along which clinicians, pathologists, and sanatorium founders may coöperate to fill them.

Briefly, the three great needs for the further growth of knowledge in regard to tuberculosis in children seem to me to be:

First, to wipe completely off our diagnostic slate the old clinical picture of pulmonary tuberculosis, based upon a group of symptoms presented in the adult, and the careful redrawing of an almost entirely new picture of the pulmonary form of disease as it presents itself in childhood.

Second, a wide and systematic study, with the most thorough modern methods of diagnosis, not merely of children who to the dull eye of their immediate family are obviously sufficiently ill to be brought to a dispensary or hospital, or even to a private physician, but of all children who are known to have been exposed to infection in the house or family, and of large bodies of children in schools and institutions, who are not especially under suspicion of infection.

Third, the establishment of sanatoriums or camps for the reception and treatment of children suffering from pulmonary tuberculosis. At present, these are practically non-existent. Neither our treatment nor our knowledge of the disease can hope to become effective and adequate unless we have an opportunity of studying large numbers of cases together, under conditions suitable for adequate control and observation. The value of the sanatorium as a means of increasing our knowledge of tuberculosis has been even greater than its curative influence.

The amount of work done and the masses of data accumulated upon this subject are enormous. But it would probably be fair to say that the chief net result of their accumulation so far,—and probably the most useful,—has been to make us doubt the correctness of our previous views. And the

process is still continuing. Half a century ago we felt fairly confident that, while the pulmonary form of tuberculosis was both the commonest and the most frequent cause of death in adults, this was not the case in children; but that, on the contrary, certain other organs and groups of tissues were more frequently the site of the disease—notably the lymph-glands, the bones and joints, and the meninges. Tuberculosis was, in fact, regarded as a generalized disease in children, and as a localized one in adults. Most of the older text-books flatly state that pulmonary tuberculosis is rare in children under the age of ten, or even as late as fifteen years. And even as recently as the last United States Census, and the mortality reports of the New York City Board of Health, we find the mortality from the pulmonary form of tuberculosis in children far outranked by the osseous, the meningeal, and even the intestinal. Indeed, so far as statistics based upon mortality records are concerned, all over the world to-day pulmonary tuberculosis would appear to be one of the least frequent forms of fatal tuberculosis in children. So universally is this apparent condition accepted as a fact that it gives rise to some most extraordinary misunderstandings. For instance, when so distinguished and eminent a statistician as Mr. Karl Pearson, in his recent admirable work upon the inheritance of pulmonary tuberculosis, explains the discrepancy between two groups of percentages of tuberculosis by the statement that one of them contained a large number of children under the age of fifteen, "in which period consumption is extremely rare."

With the discovery of the bacillus, and the succeeding demonstration of the tuberculous nature of the old "struma" and "scrofulous" group of lesions of the skin and bones, the special tendency of tuberculosis to localize in these structures in children seemed strikingly corroborated. But in the meantime other data were accumulating, which were destined to seriously undermine it. This was the accumulation of thorough and systematic post-mortem examinations of the bodies of children dead of all sorts of diseases. So long as these examinations merely confined themselves to ascertaining the probable cause of death, comparatively little progress was made. But when the practice was once established of thoroughly and systematically examining every organ and important tissue of the body with reference to the possible presence of tuberculosis, then a very different state of affairs began to reveal itself. Instead of the lung being the least frequently affected organ, it was found to be the most so. What made these results the more interesting and the more unexpected was that many of them were carried out in the attempt, which is still persisting, to discover through the localization of these lesions the port of entry and probable source of the infection. Those observers, who are inclined to believe that the infection in tuberculosis came chiefly through ingestion, were specially interested in involvements of the intestines and of the mesenteric glands. But however

few or numerous these might be found to be, they were always well below the lungs in frequency of involvement.

In fact, the more thorough and systematic these examinations were made, and the more frequently inoculation tests were included, the more nearly universal became the degree of pulmonary involvement, until some of the later data, like Kossel's, record as high as 93 per cent. of pulmonary lesions. Adams, of the Washington Hospital, gives 90 per cent. of lung and bronchial involvement, while in Holt's 119 cases under three years the lungs were affected in 99 per cent. and the bronchial lymph-nodes in 96 per cent.

Almost equally striking is the change that has come over our reports of the percentage of tuberculous lesions in the children admitted to our clinics and pediatric hospitals. As recently as five years ago these percentages ranged from half of 1 per cent. to 2 per cent., 3 per cent. or occasionally as high as 6 per cent. Now the proportion of cases of tuberculosis admitted to children's hospitals has reached 25 per cent., 30 per cent., and 35 per cent. Indeed, Holt's latest reports give 41 per cent.—and the end is not yet. These increasing percentages—due entirely to a more adequate knowledge of the disease, more thorough examinations, and consequently greater accuracy of diagnosis—furnish at least a part of the basis for the claim frequently advanced that tuberculosis is increasing in frequency in young children, while diminishing at every other age.

In fine, all the data at our disposal point clearly to the fact that tuberculosis of all varieties is vastly more common in young children (at all events, young children in the hospital classes) than was previously believed. And while they do not as yet appear to have thrown much light upon the precise source of infection, whether human or bovine, inhalation or ingestion, yet they do justify us in regarding the question of infection as in large measure a problem of infancy and early childhood. If we can control the spread and development of tuberculosis during the first five years of life, we can control its entire progress in the community. As certain of our great religious schools used to say: "Give us the teaching of a child until ten years of age, and we care not who attempts to mold him after that." In eight cases out of ten we are almost prepared to say that, given an ideal environment up to the tenth year, and we can go far to guarantee the child against the development of tuberculosis in later life.

An exceedingly interesting and valuable contribution to the study of this problem has recently been made by the various dispensaries for the care of tuberculosis in several of our larger cities, by extending the study of the tuberculous individual so as to include the members of his or her family. Wherever it is feasible, the nurses attached to such a dispensary, when visiting the patients in their homes, make inquiries as to the existence and number of children in the family. If any are present, they are brought into the

clinic, regardless of their apparent condition of health, to be carefully and thoroughly examined for the existence of tuberculosis in any form. The results are little short of appalling, showing that from 20 per cent. to as high as 50 per cent. of all the children of tuberculous parents, thus brought in for examination, are suffering from the disease in some form, the general average being in the neighborhood of 30 per cent. The better the opportunities and the more careful and exhaustive the examination and testing, the higher the percentage discovered.

I have also visited most of the hospitals and institutions in and near New York which are devoted to the care of tuberculous children. These, unfortunately, though not unnaturally, in view of our lateness in the recognition of the occurrence of pulmonary tuberculosis in children, are chiefly limited to cases of bone, joint, and glandular tuberculosis. Indeed, only one, in all this array, will admit children suffering from pulmonary lesions, on account of the danger of infection.

The experience of the physicians in the orthopedic hospitals and wards is almost unanimous, and in accord with the views generally held by the profession and the text-books—that children suffering from joint and bone tuberculosis comparatively seldom show definite or progressive lesions in the lung. If such lesions be present, they are in a comparatively dormant or recessive stage; and in the vast majority of instances do not progress, but clear up and disappear under the treatment—and *pari passu*—with the improvement of the bone and joint.

On the other hand, the results of Dr. Miller and Dr. Woodruff's exceedingly careful and painstaking study of 150 children of tuberculous parents show first, that the disease was present in 51 per cent., but that in only 1 per cent. did it occur in the bones or the joints, while 71 per cent. of those infected presented definite pulmonary signs, and 20 per cent. more gave a history of a cough.

Secondly, instead of the glandular form of the disease being an earlier stage, the precedent of a pulmonary inflammation, though enlarged glands were present in 79 out of the 150 cases, only a little over half of these could be shown to be tuberculous, and the vast majority of these had pulmonary involvement as well. It would almost appear as if these unexpected findings supported the suggestion that the pulmonary lesion was primary in both bony and articular tuberculosis and in glandular tuberculosis.

Thirdly, of the other group of glandular bodies supposed to be closely associated with tuberculosis, as ports of entry, if in no other way, hypertrophied tonsils and adenoids, the connection is even less positive. Sixty-five out of the 150 cases had hypertrophied tonsils and adenoid growths. Out of this number, only 31, or 47 per cent., were considered tuberculous, as compared with 51 per cent. of the entire number, which gave positive

reactions. In other words, instead of a larger percentage of those having adenoids giving evidence of tuberculosis, a smaller percentage than the average did so.

Finally, careful physical examination of the lungs and chest have gone far to establish a new clinical picture for pulmonary tuberculosis in children, with the most frequent and significant local lesions not in the apices, but in the neighborhood of the nipples, below and slightly external to them, and more frequently in the left one, instead of in the right, as in the adult.

Further, the valuable data collected by the physicians to the now famous Sea Breeze Home for Crippled Children show that repeatedly the child with Pott's hip-joint disease comes from an infected home, and is often the sole survivor of a family of four or five children dead of other forms of tuberculosis. Dr. Charlton Wallace's painstaking study of 443 children with tuberculous bone lesions, received at the New York Hospital for the Ruptured and Crippled, showed that 196 came from houses recorded as previously infected, and 130 from tuberculous families, a total of 73 per cent. giving clear history of exposure to infection.

The data so far collected appear to point toward the following conclusions as probable: First, that the frequency of pulmonary tuberculosis in children is much greater than was formerly supposed. Second, that the lung is the most frequent site of tubercular involvement in children, as in adults. Third, that whatever the port of entry, the lung suffers most severely and frequently. Fourth, that instead of tuberculosis having a special preference for the bones, joints, and glands in childhood, the tuberculous process in these regions and tissues would appear to be secondary to the involvements of the lung, and to represent a residual stage of a generalized infection. Fifth, that it would appear probable that even the glandular forms of tuberculosis did not represent an earlier or milder form of the infection, but are secondary to a pulmonary involvement. Sixth, that the moderate but appreciable degree of immunity against pulmonary tuberculosis possessed by children who have manifested osseous, articular, or glandular forms of the disease is possibly to be interpreted on the theory that they have already survived a considerable degree of pulmonary involvement. Seventh, that such immunity as may be acquired by civilized races is probably like the immunity of the negro races to malaria—the result of the survival of attacks of the pulmonary form of the disease in childhood. Lastly, that the field in which the decisive battle of our future campaign against tuberculosis must be fought is the home; our chief enemy, infection in early childhood; our heaviest gun, and our most crying need, camps, "preventoria," for the reception and cure of infected children before they have become unmistakably tuberculous.

La Localisation primaire de la Tuberculose chez les Enfants.— (HUTCHINSON.)

Les chiffres obtenus jusqu'ici semblent faire prévoir les conclusions suivantes comme probables: 1. Que la tuberculose pulmonaire chez les enfants est beaucoup plus fréquente qu'on le supposait autrefois. 2. Que le poumon chez les enfants, comme chez les adultes, est le siège le plus fréquent des troubles tuberculeux. 3. Quel que soit le point d'entrée, le poumon est le plus sévèrement et le plus fréquemment affecté. 4. Que la tuberculose n'a pas une préférence spéciale pour les os, les articulations et les glandes chez les enfants, mais que le progrès de la tuberculose dans ces régions et ces tissus semblerait être secondaire aux troubles existant dans les poumons et représenter un état résiduel d'une infection générale. 5. Qu'il semblerait probable que même les formes glandulaires de la tuberculose ne représentent pas une forme plus précoce et plus bénigne de l'infection, mais sont secondaires à des troubles pulmonaires. 6. Que le degré d'immunité, modéré, quoique appréciable, contre la tuberculose pulmonaire, dont jouissent des enfants qui ont exhibé des formes osseuses, articulaires ou glandulaires de la maladie, peut être expliquée par la théorie que ces enfants ont déjà survécu un degré considérable de troubles pulmonaires. 7. Que cette immunité, comme celles qui peuvent être acquises par les races civilisées, est probablement comme l'immunité des races nègres pour la malaria—elle résulte d'avoir survécu aux attaques des formes pulmonaires de la maladie dans l'enfance.

Enfin, que le terrain où aura lieu la bataille décisive de notre future campagne contre la tuberculose, est la maison; notre ennemi principal, l'infection dans les premières années de l'enfance; nos plus forts canons de protection et notre besoin le plus pressant, des camps, des "preventoria" pour recevoir et traiter les enfants infectés ou exposés, avant qu'ils ne soient devenus surement et complètement tuberculeux.

THE DISTRIBUTION OF TUBERCULOUS LESIONS IN INFANTS AND YOUNG CHILDREN: A STUDY BASED UPON POST-MORTEM EXAMINATIONS.

By Martha Wollstein, M.D.,
Pathologist to the Babies' Hospital, New York City

In view of the interest and importance of the question concerning the manner of infection and the localization of tuberculous lesions in the human subject, it seemed that the analysis of the autopsy material at the Babies' Hospital, of the city of New York, would prove of value in showing the facts in a number of city-bred infants and young children, the great majority from the most crowded and unhygienic tenement districts, badly fed and badly cared for before entering the hospital in all stages of tuberculosis.

From October, 1889, to July, 1908, 1131 autopsies were performed, of which 185, or 16.4 per cent., showed tuberculous lesions in one or more organs. The hospital admits children under three years only, and the records show that 60 per cent. of all admissions are infants under one year of age, and that the death-rate is exactly three times as high among these young babies as it is among the children from one to three years old. Of all the autopsies performed, 77 per cent. were on infants under one year, and 26 per cent. under three months of age, while only 5 per cent. were on children older than two years, including four who were four years old.

From the 185 cases of tuberculosis, we learn that 11 per cent. of all infants under one year of age coming to autopsy showed tuberculous lesions, while 35 per cent. of those between one and two years, and 27 per cent. of those over two, were so affected. Of infants under three months of age, but $1\frac{4}{5}$ per cent. had tuberculosis. These figures are rather higher than those reported by Frobelius (2.2 per cent.), Heubner (3.2 per cent.), Kossel (6 per cent.), Orth (3.4 per cent.), and Sehlbach (7.8 per cent.), in babies under one year of age, and approach more nearly those of Mamburger (15.4 per cent.) and of Trepinski (15 per cent.), whose second-year statistics (34.5 per cent.) also coincide closely with our own, Hamberger's 40 per cent. of second-year children being somewhat higher. Contrasting the percentage of cases afflicted with tuberculosis in the four quarters of the first year of life, we find:

First Year.				Second Year.	
1st Quarter.	2d Quarter.	3d Quarter.	4th Quarter.	1st Half.	2d Half.
1⅘%	11%	16%	23%	33%	44%

Hamburger's figures for the same period are as follows:

1st Quarter.	2d Quarter.	3d and 4th Quarters.	Second Year.
4%	18%	23%	40%

Both tables show a progressive increase in the number of tuberculosis autopsies throughout the first and second years of life. Seventy-eight girls and 107 boys were affected.

The higher percentage of tuberculosis in young infants in our cases may be partly dependent upon the fact that many nationalities are comprised among them, living under climatic and other conditions which differ widely from those to which they have been accustomed in their native land, and that overcrowding and lack of cleanliness not only predispose the infants to infection, but make the disease rapidly fatal.

In analyzing this series of cases, it seemed most rational to group them according to the relative age and distribution of the tuberculous lesions, with a view to deducing from such a classification such facts as became pertinent from its study. It is perfectly true that the localization of the oldest lesion is not always synonymous with the point of entrance of the tubercle bacillus, and that the greater number of cases of extensive pulmonary as compared with intestinal tuberculosis by no means proves that all such cases result from aspiration rather than from ingestion of the bacilli. It has been proved by Orth, Ravenel, Herman, and others, that the tubercle bacillus may pass through the normal intestinal wall without any lesion resulting at that point, though it may produce tuberculosis in the mesenteric lymph-nodes or become localized there for a shorter or longer period of latency, causing the lymphoid stage of tuberculosis described by Bartel and Spieler, which is a pre-tuberculous stage of simple, non-characteristic hyperplasia, the tuberculous nature of which can only be demonstrated by means of animal inoculation with the suspected lymph-nodes. The studies of Bartel and Newmann showed that in the cervical and mesenteric nodes the lymphoid stage tends to be more marked than in the bronchial nodes, which present a greater tendency to cheesy degeneration than do the mesenterics. This latter point is fully borne out by the observation of our cases. It is nevertheless difficult to understand why a primary pulmonary (inhalation) tuber-

culosis should not, by the swallowing of its sputum, cause similar hyperplastic changes in the mesenteric lymph-nodes, these being, in such a case, of later, and not of earlier, date than the pulmonary lesion. Animal experiments with such mesenterics, if positive, would hardly elucidate this point, as to whether the localization of the tubercle bacilli had taken place before or after infection of the bronchial nodes and lungs. That the intestines and mesenterics are infected secondarily by sputum swallowing in patients with pulmonary tuberculosis is certain. Why, then, should it not be possible to obtain such a case at autopsy, with the mesenterics so slightly changed as to simulate the lymphoid stage of latency, paradoxical as such a proposition appears?

According to the lesions found in my cases, they may be grouped as follows:

GROUP I.

1. Those showing pulmonary lesions only.
2. Those showing bronchial lymph-node lesions only.
3. Those showing pulmonary and bronchial node lesions alone.
4. Those showing pulmonary and bronchial node changes as the most advanced lesion of a generalized tuberculosis.

GROUP II.

1. Those showing intestinal and mesenteric lymph-gland lesions only.
2. Those showing intestinal and mesenteric changes as the most advanced lesion of a partially generalized tuberculosis.
3. Those showing intestinal and mesenteric lymph-gland lesions as the most advanced in a completely generalized tuberculosis.

No case of congenital tuberculosis occurred in this series. The youngest (two cases) were seven weeks old. In one the lungs and bronchial lymph-nodes were affected, while a few early splenic tubercles gave evidence that hematogenous generalization had begun. The other presented a very generalized tuberculosis, the bronchial lymph-nodes showing a more extensive cheesy degeneration than the mesenteric nodes, and the pulmonary lesion being more advanced than any other. This child's mother had died of "consumption" during the second week of the infant's life.

GROUP I.

1. PULMONARY LESIONS ONLY.—There were four such instances, the tuberculous lesion in each case being limited to one lung only, and consisting of miliary tubercles in two, of an area of cheesy pneumonia in another, and of several small, cheesy, peri-bronchitic nodules in the fourth. These cases were undoubtedly of inspiratory origin. The bronchial lymph-nodes were

swollen, but without macroscopical or microscopical evidence of tuberculosis. Animal inoculations were not made.

2. Bronchial Lymph-nodes only Involved.—In one case, eight months old, several nodes at the root of the right lung showed tubercles with cheesy degeneration. No other sign of tuberculosis was found in any organ, and the case was grouped as one due to inhalation, since the lung, like the intestine, may allow the tubercle bacillus to pass through without localizing there.

3. Lungs and Bronchial Nodes Involved Alone.—Thirteen cases of this kind were noted, in which the tuberculous process was limited to the lungs and bronchial nodes, all other organs being free. It has been our custom to group these also as inhalation tuberculosis.

Both Weichselbaum and Weleminsky look upon all cases involving the bronchial nodes together with the lungs as of digestive origin, since the primary lesion in the mesenteric or cervical nodes may be in the lymphoid stage, demonstrable by animal inoculation only, or else even this may have entirely disappeared, and the primary lesion cured instead of latent. This seems both far-fetched and unnecessary, and, in the light of Gaffky's studies, untenable.

On the other hand, Flugge's experiments show that tubercle bacilli reach the lungs very slowly by way of the intestinal tract, and that relatively very large doses are required to cause infection by way of the intestine, while exceedingly small numbers will cause pulmonary tuberculosis when inhaled in the moist state, as proved by Findel.

Both Most and Beitzke, having shown that anatomically the tracheobronchial lymph-nodes are not connected with the cervical glands on the one hand, nor with the abdominal on the other, secondary infection of the bronchial nodes is possible only by way of the blood-stream, after the abdominal lymphatics have emptied their tubercle bacilli into the thoracic duct, or when a blood-vessel, in the process of degeneration of the nodes, has been entered directly. Oettinger has shown very recently, by means of feeding experiments, that tubercles do not appear in the lungs before they are formed in the other organs. When the digestive tract is the entrance point for the bacilli, and when tubercles appear in the lungs and not in the liver and spleen, the bacilli did not enter such lungs through the blood-stream. The views of Flugge and Findel are confirmed by recent studies of Osterman, Heymann, Reichenbach, and Oettinger, whose animal experiments all tend to show the greater frequency, rapidity, and ease of the respiratory over the digestive method of tuberculous infection, a view which Kuss, Medin, and Spronck also hold, in accordance with their clinical and autopsy findings, and which receives further confirmation by the results of Gaffky's study of the bronchial and mesenteric lymph-nodes from a series

of 300 autopsies in children, of whom 272 were under five years of age. The glands were examined for tubercle bacilli by the inoculation method, and the isolated bacilli tested as to whether they were of the human or bovine type. The result showed conclusively that the human type of tubercle bacillus was almost invariably present; only in 2 of 59 cases was the bovine type apparently found, and even then the bronchial and not the mesenteric glands contained them. A most interesting part of this work shows that while 36 cases were macroscopically tuberculous at autopsy, 90 others were found to contain tubercle bacilli in the lymph-glands on animal inoculation. The bronchial nodes were found infectious for tuberculosis twice as often as the mesenterics in the latent cases, and as often in the developed cases, thus proving that even in childhood the respiratory tract is more frequently the entrance point for the tubercle bacillus than is the digestive tract, and that it is the human and not the bovine type of tubercle bacillus which causes the greatest danger of infection in human beings.

4. Cases Showing Pulmonary or Bronchial Lymph-node Lesions or Both as the Most Advanced Lesions in a Generalized Tuberculosis.—These may be subdivided into two classes:

(*a*) *The tuberculosis in the lymph-nodes was more advanced than that in the lungs.* In 25 cases the pulmonary tuberculosis was of the acute miliary variety, but the bronchial lymph-nodes and the mesenterics both showed such marked cheesy degeneration that it was not possible to decide macroscopically or microscopically as to the comparative age of the two. In 3 others the mesenteric nodes were cheesy, though no intestinal ulceration had occurred, and a possible intestinal origin is admitted. Eight cases showed normal intestines and mesenterics, though liver and spleen contained tubercles. These were grouped as of pulmonary origin, and one case with intestinal ulcers, but unchanged mesenterics was looked upon as a secondary intestinal infection from swallowed sputum.

(*b*) *The tuberculosis in the lung was the oldest lesion.* In 83 cases of generalized tuberculosis in which the lungs were the seat of cheesy nodules, cheesy pneumonia, or cavity formation, the mesenteric lymph-nodes were cheesy as well as the bronchial nodes, and ulcers were present in the intestines. Twenty-six cases had normal mesenterics and intestines, 5 had cheesy mesenterics without intestinal lesions, and 5 had normal mesenterics with ulcers in the intestines. Again the probable inhalation cases predominated.

Group II.

1. Cases with Intestinal and Mesenteric Lymph-nodes Alone Involved.—But one such case occurred. It was that of a boy, twenty-two months old. Twelve tuberculous ulcers were found in the jejunum and

ileum, only one involving the peritoneal coat, and undergoing cicatrization. But four ulcers were recent. The mesenteric nodes were all enlarged and the majority contained tuberculous areas. No other tubercles were found at autopsy, but on microscopical examination the spleen showed very recent ones within the Malpighian bodies. From the mesenteric nodes of this case Dr. Alfred F. Hess isolated tubercle bacilli of the human type, a result in keeping with Gaffky's findings.

2. Cases with Intestinal and Mesenteric Lesions as the most Advanced of a Partially Generalized Tuberculosis.—There were six such instances:

(*a*) Boy, two years old. A tuberculous ulcer in the Peyer's patch above the ileocecal valve extended to the peritoneal coat, to which a cheesy lymph-node was adherent; two other and younger ulcers were in the ileum; all mesenterics were swollen and the majority contained cheesy tubercles. A few tubercles in the pia mater over both cerebral hemispheres were the only other evidence of tuberculosis in the body.

(*b*) Boy, two years old. One early tuberculous ulcer in the ileum and two in the cecum; most of the mesenterics contained cheesy tubercles; one had become softened; miliary tubercles in pia mater, liver, and lower lobe of right lung; bronchial nodes not tuberculous.

(*c*) Boy, fourteen months old. One ulcer in jejunum involved the peritoneum, and two in the ileum; the majority of the mesenterics were cheesy and one had broken down; recent tubercles in spleen and liver.

(*d*) Boy, nine months old. Few ulcers in jejunum and upper ileum of recent date, many mesenterics contained cheesy areas; tubercles in liver, spleen, and kidneys; several bronchial lymph-nodes cheesy.

(*e*) Boy, eleven months old. Two recent tuberculous ulcers in the jejunum and two longer healing ones in the ileum; several solitary follicles in the cecum were cheesy. Many mesenteric lymph-nodes contained a cheesy tubercle, and one a calcareous area. One bronchial node showed a small calcareous spot, and another several cheesy tubercles, making it apparent that the case was of both aspiratory and digestive origin.

(*f*) Boy, one year old. Admitted with stomatitis and dicharging (operation) wound over the left submaxillary gland. No history of tuberculosis in the family. All the cervical lymph-nodes became enlarged; stomatitis and gingivitis very severe; pulmonary signs only ten days before death. At autopsy all the cervical nodes were found to have undergone cheesy degeneration, and the left submaxillary gland contained cheesy areas. Miliary tubercles were present in both lungs, liver, spleen, and omentum; nine tuberculous ulcers in the jejunum and ileum; tubercles in bronchial and mesenteric lymph-nodes, but no large areas of cheesy degeneration. This must be looked upon as a case of combined deglutition and aspiration tuberculosis.

The ingested bacilli affected the submaxillary gland and the cervical lymph-nodes by way of the lymphatics of the mouth and pharynx, and the intestines and mesenterics by being swallowed. At the same time some of the bacilli, aspirated directly into the lungs, caused the pulmonary and bronchial lymph-node lesions. Generalization by the blood-current resulted from both the cervical and the mesenteric nodes. While hemotogenous infection of the lungs and bronchial nodes is not impossible, the peribronchial distribution of many of the smallest tuberculous areas in the lungs speaks for the aspiration method. That the tonsils and gums were not examined in this case is a matter of great regret.

3. Cases Showing Intestinal and Mesenteric Lesions as the Most Advanced in a Completely Generalized Tuberculosis.—Only two cases occurred in this series in which the intestinal lesions were so extensive and advanced that the possibility of their being the earliest of a completely generalized tuberculosis presented itself.

It is evident that in our entire series of 185 cases there are but 7, or $3\frac{4}{5}$ per cent., which may be positively classified as primary intestinal tuberculosis. Only two were less than one year old.

Medin found, among 595 autopsies on tuberculous infants under one year of age, but 6 cases of primary intestinal tuberculosis, while in 273 the tuberculous process involved the lungs and bronchial lymph-nodes alone. Hamburger reports that in four years, among 335 autopsies on children with tuberculosis, no case of positive primary intestinal infection was encountered, while 85 cases were primarily bronchogenous. German authorities, as a rule, agree that cases of primary intestinal infection in infants and young children are rare. Heller is an exception, having found it in 37.8 per cent. of his cases. English statistics on this subject are also high, Still reporting 29 per cent., and Thorne 30 per cent. Fürst estimates that about 160 cases of primary intestinal tuberculosis have been reported, including both adults and children.

No case in any series showed involvement of the mesenteric lymph-nodes as the only evidence of tuberculosis at autopsy. In twelve instances the mesenterics had undergone cheesy degeneration without the presence of ulcers in any part of the intestinal tract. In all of these there was marked pulmonary tuberculosis, and the question of the initial lesion remains open, though, according to Weichselbaum, Weleminsky, Von Behring, and Calmette, it would seem to be in the mesenteric lymph-nodes.

The ulcers in the intestines were found to be most frequent and most advanced in the lower ileum, especially in the last Peyer's patch above the ileocecal valve. Ulcers were found above this point more often than below it, being present in the jejunum and ileum more frequently (35) than in the ileum and cecum (28). Seipel also found that the colon was involved less

than the jejunum and ileum. The jejunum, ileum, and cecum were involved in 14 cases. The two ends of the intestinal tube were scarcely involved at all, ulcers being found in the rectum but twice and in the duodenum four times, but never alone. The gastric ulcers noted in 4 cases were superficial only. So also, in Seipel's 6 cases, the ulcers in the stomach were superficial and not confluent.

In the kidneys young miliary tubercles were found in 67 cases, almost always in both organs. The tubercles were for the most part few in number and always localized in the boundary zone between the cortex and medulla, or in the cortex beneath the capsule; in either case of hematogenous origin. Very small, conglomerate, cheesy tubercles were found in 5 cases, but again they were in the boundary zone and encroached on both cortex and medulla. The calyces and pelvis were invariably free from tuberculous infection.

The pulmonary lesions varied much, there being: recent, discrete, miliary tubercles; conglomerate tubercles forming cheesy nodules of smaller and larger size, often peribronchial in distribution; larger areas of cheesy pneumonia with or without cavity formation from softening. Sometimes all these varieties were found in the lungs of a single case. The oldest lesion in the lung was found on the right side in 95 cases, on the left in 66, and equally in both lower lobes in 3. The right upper lobe was involved rather more often than the middle or the lower lobes. The lungs were free from tuberculosis in only 7 cases.

Cavity formation was noted in 39 cases, 6 involving more than one lobe. The cavities occurred more often on the right (26) than in the left lung (19), and more often in the upper and middle than in the lower lobes.

In the case of the bronchial lymph-nodes, the largest were found on the right side in 97, on the left in 34 cases. This preponderance of the right over the left-sided pulmonary and bronchial lymph-node tuberculosis is attributable to the purely mechanical fact that the right main bronchus is slightly shorter and bends away from the trachea less than does the left main bronchus, therefore aspiration is facilitated in the direction of the right lung.

The mediastinal lymph-nodes were markedly affected in 38 cases, the cervical in 6, and the retroperitoneal in an equal number. While caseation was the rule in all these variously situated lymph-nodes, and suppuration was more common in the bronchial than in the mesenteric nodes, calcareous change was found but once in a mesenteric and five times in a bronchial lymph-node, showing that the tendency of the tuberculous process in the lymph-nodes of these young children is toward progressive degeneration rather than toward healing. Seipel found calcareous deposits in but 2 of his 32 cases, and concludes that such changes are unusual in infants; and Schlossmann calls attention to the absence of any tendency toward healing

in cases of infantile tuberculosis. The youngest case in which he found an attempt at encapsulation in a pulmonary, cheesy mass was in a child fifteen months old. Hamburger found no case of healed tubercles in children under three years old.

The following table shows the localization of the lesions in the individual organs:

Pia mater	Tubercles only, 21. Tubercles and inflammatory exudate, 44.
Brain	Solitary tubercle, 5; largest 4 x 3 x 3 in right Sylvian fissure; 3 in occipital, 1 in frontal.
Pleura	Tubercles 60; with empyema, 9; with bloody serous fluid, 10; chronic pleurisy, 29; acute fibrinous, 39.
Lung	Miliary tubercles only, 41; miliary tubercles and cheesy nodules, 54; cheesy pneumonia, 51; cavities, 39.
Pericardium	Tubercles pericarditis at base, with one tubercle on pulmonary artery, 2.
Heart	Tubercle in wall of left ventriele, 1; in papillary muscle of left ventricle, 1; in endocardium, 1.
Peritoneum	General tubercular peritonitis, 3; local over liver and spleen, 6; local over ulcers, very many.
Liver	Tubercles, 157.
Spleen	Tubercles, 161.
Stomach	Ulcers, single in 3; double in 1; all superficial.
Duodenum	Ulcers, with jejunum, 1; with ileum 1; with ileum and cecum, 1.
Jejunum	Ulcers alone, 7; with ileum, 35; with colon, 2; with ileum and cecum, 14.
Ileum	Ulcers alone, 21; with jejunum, 35; with cecum, 24; with colon, 3; cheesy solitary follicles, 1.
Cecum	Ulcers alone, 5; with ileum, 24.
Colon	Ulcers with jejunum, 2; with ileum, 3.
Rectum	Ulcers, with ileum, 2.
Pancreas	Cheesy masses, 4.
Suprarenals	Tubercles, 5; microscopical only in 1.
Kidneys	Tubercles, 67; small cheesy masses, 5.
Thymus	Tubercles, with cheesy degeneration, 5.
Submaxillary	Tubercles, with cheesy degeneration, 5.
Bronchial nodes	Tubercles, with cheesy degeneration, 147; suppuration, 24; calcareous degeneration, 5.
Mesenteric nodes	Tubercles, with cheesy degeneration, 131; suppuration, 3; calcareous degeneration, 1.
Cervical nodes	Tubercles, with cheesy degeneration, 6.
Retroperitoneal nodes	Tubercles, with cheesy degeneration, 6.
Mediastinal nodes	Tubercles, with cheesy degeneration, 38.

This study shows how comparatively rare primary intestinal tuberculosis was in this series of infants and children under three years of age, and that, even when due allowance has been made for all doubtful cases, tuberculosis of respiratory origin predominated over that due to ingestion of the bacilli in these young subjects.

I am indebted to Dr. L. Emmett Holt for permission to make use of the Babies' Hospital material and records.

BIBLIOGRAPHY

Fürst: Intestinale Tuberkulose-Infection. Stuttgart, 1905.
Weichselbaum: Sechste Internat. Tuberkulose-Konferenz, 1907, p.11.
Flügge: Ibid., p. 46.
Weleminsky: Ibid., p. 119
Medin: Ibid., p. 120.
Most: Ibid., p. 132.
Ravenel: Ibid.. p. 102.
Herman: Ibid., p. 103.
Orth: Ibid., p. 67.
Orth: Berliner klin. Wochens., 1904, xli, 265, etc.
Findel: Zeits. für Hygiene, 1907, xxxvii.
Kossel: Ibid., 1896, xx.
Fröbelius: Jahrb. für Kinderheilk., 1886, p. 24.
Bartel und Neumann: Quoted by Weichselbaum.
Trepinski: Quoted by Fürst.
Heller: Deutsche med. Wochens., 1902, xxviii, 696.
Still: Practitioner, 1901.
Thorne: Quoted by Fürst.
Von Behring: Berl. klin. Wochens., 1906, xl; 1904, xli.
Von Behring: Tuberculosis, 1907, vi, 423.
Hess: Amer. Jour. Sciences, 1908, cxxxvi, 183.
Calmette et Guérin: Annales de l'Inst. Pasteur, 1906, xx.
Calmette: Tuberculosis, 1907, vi, 102.
Hamburger: Wien. klin. Wochens., 1907, xx, 1069.
Seipel: Zeits. für Hygiene, 1906, xiii, 1.
Schlossmann: Tuberculosis, 1907, vi, 79.
Kuss: Ibid., 1907, vi, 374.
Gaffky: Ibid., 1907, vi, 437.
Beitzke: Virchow's Archiv, 1906.
Spronck: Tuberculosis, 1907, vi, 101.
Oettinger: Zeits. für Hygiene, 1908, lx, 557.
Heymann: Ibid., 1908, lx, 424, 490.
Ostermann: Ibid., 1908, lx, 375.
Reichenbach: Ibid., 1908, lx, 446.

Die Verteilung tuberkulöser Verletzungen bei Säuglingen und jungen Kindern. Eine Studie auf Grund von Autopsien.—(WOLLSTEIN.)

Unter 1,131 Autopsien, die an Kindern, 4 Jahre alt, gemacht wurden, zeigten 185 Tuberkulose. Da 78 Prozent aller Autopsien an Säuglingen unter einem Jahre vollzogen wurden, zeigte sich eine tuberkulöse Affektion von 12 Prozent in jenem Alter. Während des zweiten Lebensjahres hatten 33 Prozent aller Fälle, die zur Autopsie kamen, Tuberkulose, und von jenen, die älter als zwei Jahre waren, 34 Prozent. Es waren 4 Fälle weniger als drei Monate alt, der jüngste davon sieben Wochen. Es kam kein Fall von angeborener Tuberkulose vor. In einem Falle war die einzige tuberkulöse Verletzung in den Bronchialdrüsen gefunden worden; in vier war die Lunge allein in Mitleidenschaft gezogen, und in 13 die Lungen- und Bronchialdrüsen. Es waren 7 Fälle primärer Infektion des Verdauungstraktes vorhanden, einschliesslich zweier gemischten Ursprunges der Schluck- und Atmungsorgane. Von den vorgeschritteneren allgemeineren Fällen gaben nur zwei eine

Erscheinung von Möglichkeit eines Ursprunges in den Gedärmen, während 40 im Respirationstrakte begannen. In der Mehrheit ausgedehnt allgemeiner Fälle von Tuberkulose bei jungen Kindern ist es zweifelhaft, den genauen Eintrittspunkt zu finden. Obwohl die Lungen häufiger als irgend welche anderen Organe in Mitleidenschaft gezogen sind, beweist dies eher ihre besondere Prädisposition zu Tuberkulose, als ihre primäre Infektion. Nichtsdestoweniger überwiegen die Fälle respiratorischen Ursprunges jene, wo der Ursprung in den Verdauungsorganen zu finden ist.

La Distribution des Lésions tuberculeuses chez les Bébés et chez les petits Enfants. Étude fondée sur Autopsies.—(WOLLSTEIN.)

De 1,131 autopsies d'enfants âgés de moins de quatre ans, 185 présentaient la tuberculose. Du nombre total d'autopsies, 78 pour cent étaient sur des enfants âgés de moins d'un an et de ces enfants 12 pour cent étaient atteints de tuberculose. De tous ceux qui moururent pendant la seconde année de leur vie, 33 pour cent avaient la tuberculose, et de ceux plus âgés que deux ans, 34 pour cent. Quatre enfants avaient moins de trois mois, le plus jeune étant âgé de sept semaines. Nul cas de tuberculose congénital ne fut observé. Dans un cas la seule lésion tuberculeuse se trouva dans les glandes bronchiales; dans quatre, les poumons seulement étaient atteints; dans treize, les poumons et les glandes bronchiales. Il y avait sept cas d'infection primaire de la voie alimentaire, y compris deux cas à origine alimentaire et respiratoire mixte. Parmi les cas avancés et les cas de tuberculose générale, deux seulement paraissaient être d'origine intestinale, tandis que dans quarante la maladie avait commencé dans la voie respiratoire.

Dans la plupart des cas de tuberculose générale étendue chez les petits enfants il n'est pas possible de préciser la porte d'entrée. Quoique les poumons soient atteints plus fréquemment que tous les autres organes, ce fait démontre leur prédisposition à la tuberculose plutôt que leur infection primaire. Tout de même les cas d'origine respiratoire l'emportent sur ceux dans lesquels les bacilles s'introduisent par la voie alimentaire.

TUBERCULOUS PULMONARY CAVITIES IN INFANTS.

By C. Y. White, M.D.,
Pathologist to The Children's Hospital of Philadelphia,
and Howard Childs Carpenter, M.D.,
Assistant Pathologist to the Children's Hospital of Philadelphia.

In reviewing the literature on the subject, the fact impresses itself that many writers on diseases of infants treat the subject in a very indefinite manner. Some do not refer to it; while others speak of it as if tuberculous cavities in infants followed the general course of events so frequently seen in the adult. This is somewhat surprising, because most of the authors who have written especially on this subject point out how difficult it is to make an ante-mortem diagnosis of a cavity in comparison to the condition in later life. We have had difficulty in selecting our cases from this literature, because many authors have failed to make the distinction between infancy and childhood. In this paper we have accepted the customary age limit of two years for infancy; consequently, we have only selected those cases from the literature in which we have either been able to ascertain definitely their age, or at least believed they were under two years.

For our purpose the subject may be divided into the following heads: (1) The frequency of cavity formation in the lungs of infants. (2) The pathology of the condition. (3) The location of the cavities in the lungs. (4) The report of six cases.

1. The Frequency of Cavity Formation in the Lungs of Infants.—From the literature we have been able to find special mention of cavity formation in a number of instances. These cases have been sifted from general discussions of the subject, rather than special reports of cases. We believe many cases have not been recorded, because observers have not deemed it of sufficient importance to report them. Clinically, in the vast majority of cases cavity formation in the lungs of infants is entirely overlooked. We believe, therefore, that by calling attention to its frequency and localization, cavities should be more often recognized during life.

Leroux, in analyzing Parrot's cases, found cavity formation present in 57 cases out of 219 autopsies on patients under three years of age; that is, 26 per cent. of the cases. He particularly mentions 5 of these cases which were under three months of age, but unfortunately no reference is made to the number under two years. Warthin and Cowie quote the following five authors: Huguenin, as reporting 2 cases, a seven-month premature infant

and an infant seven weeks old; Berti, as reporting 1 case nine days old; Demme, as reporting 1 case eleven weeks old; Queyrat, as reporting 1 case three months old; Flesch, as reporting 8 cases out of 500 autopsies on children in the early months of life. Demme reports 1 case, aged four weeks. F. Weber reports 1 case, aged three months. Henock reports 5 cases, ages four, seven, eight, ten, and eighteen months. Comby reports four cases, ages four, six, eight, and nine months. Deliarde reports 1 case, age six months, and speaks of the rareness of cavity at this age. Symes and Fisher, in reporting 500 deaths at various ages from tuberculosis, refer to 2 cases with cavities; five and eight months old. Shennan reports 23 cases having cavities, in a total of 355 cases, that is, 6.5 per cent. Carmichael reports 2 cases, ages eight and fifteen months. Toulmin reports 1 case, four months old. Donkin reports 1 case, aged one year. Fry and Shaw report 1 case, twelve months old. Price-Jones reports 3 infants, thirteen, sixteen, and twenty-two months old. J. Lewis Smith reports 1 case, aged seventeen months. Green reports 6 cases, under two years. Barthez and Sanne report 10 cases, under two years.

Zuber says, "All authors agree that cavities are rarer in children than in adults"; and Baginski states, "chronic tuberculosis with cavity formation in young children in characteristic form, as in the adult, is an infrequent disease." Other authors, as Rotch, Monti, Jacobi, Still, Osler, and Ashby, speak in general terms of the rarity of cavities in infants under two years compared with older children. The above mentioned cases, in all likelihood, do not represent the observations of these men as to the frequency of cavity formation, but simply some of the cases which they have had occasion to refer to in reports. On the other hand, the following observers have found cavitation in infancy of more frequent occurrence.

Northrup in a personal communication says: "Tuberculous cavities are not rare in infants as young as a few weeks even. They follow the law which would seem to apply to adults. . . . The lesion is common." Rilliet and Barthez report cavities in the proportion of 1 to 3, in patients from one to two and a half years old. Holt says: "Areas large enough to deserve the name cavities were present in 35 of 72 autopsies upon tubercular patients, two years old and under." De Rothschild states that pulmonary cavities are observed in one-third of the cases from one to two and a half years. Hervieux reports that one-fifth of the cases in the course of the first year of life have pulmonary cavities. J. Francis Condie went so far as to say, "Tuberculous cavities are much more frequent in very young children than in adults." Warthin and Cowie quote Weber as making the statement that he had many times observed tuberculous cavities of the size of half a lobe in children under the age of three months.

From the above résumé of the literature, it will be seen that the frequency of cavity formation in infancy has been observed by some in a high per-

centage of cases; while by others, it has been found but rarely. From the few cases which we have been able to collect from the literature, the earliest case occurred in an infant premature at the seventh month; while the majority were found beyond the third month, with increasing frequency toward the end of infancy.

In order to estimate the frequency of tuberculous cavities in infants at the Children's Hospital of Philadelphia, the records for the past seventeen years have been reviewed. We have found that during this time 4518 infants have been admitted to the wards of the hospital. Of this number, 1140 infants have died, a mortality record of 25.2 per cent. of the admissions. Of the total number of deaths, 6.5 per cent. were tuberculous. However, these figures are only approximate, because only one-third of the children dying were autopsied. Again, if we consider the number of tuberculous autopsies compared with the total number of admissions during this period, it will be found that 75 cases, or 1.6 per cent., were tuberculous. It will be seen from the statistics of autopsy that, with us, tuberculosis in infants under two years of age is infrequent. This is partly explained by the fact that the majority of infants coming to the hospital have some form of advanced gastro-intestinal disorder. If the actual number of cases of gastro-intestinal disease be studied from our autopsy records, it will be seen that 155 cases out of the 371 autopsies performed (or 41.7 per cent.) were grouped under this head. Therefore, if these cases of advanced gastro-intestinal diseases be omitted from our comparison, it will be seen that, of the remaining autopsies (216), there were 75 cases, or 34.5 per cent., tuberculous. This latter comparison really emphasizes the high mortality of gastro-intestinal disorders (41.7 per cent.) far more than it does of tuberculosis (34.7 per cent.) at this age. For we believe, from the clinical aspect at least, that our former percentage of 1.6 per cent. of fatal cases is nearer the truth, as far as tuberculosis at this age is concerned. Below we have tabulated the ages of tuberculous infants coming to autopsy:

First Year.		Second Year.	
One month old	0 cases.	Twelve months old	7 cases.
Two months old	1 case.	Thirteen months old	3 cases.
Three months old	2 cases.	Fourteen months old	6 cases.
Four months old	1 case.	Fifteen months old	4 cases.
Five months old	5 cases.	Sixteen months old	3 cases.
Six months old	9 cases.	Seventeen months old	3 cases.
Seven months old	5 cases.	Eighteen months old	6 cases.
Eight months old	3 cases.	Nineteen months old	4 cases.
Nine months old	2 cases.	Twenty months old	1 case.
Ten months old	5 cases.	Twenty-one months old	1 case.
Eleven months old	2 cases.	Twenty-two months old	0 cases.
		Twenty-three months old	2 cases.
	35 cases.		40 cases.

Number of autopsies on tuberculous infants under one year.....35
Number of autopsies on tuberculous infants between one and two years.40

Total number of autopsies on tuberculous infants under two years....75

To study the frequency of cavity formation in the lungs of infants dying of tuberculosis, we have gone over the records of the Children's Hospital, and found that cavity formations were present in 12 cases of the 75 dying of tuberculosis, or 16 per cent.

As was stated above, we encountered difficulty in trying to estimate this frequency from the literature. In only a few reports were actual statements as to percentage obtainable. In our cases 1 in 6 showed excavations; which is a lower percentage than the observations of the quoted authors. Nevertheless, it will be seen even in our cases that cavity formation is not uncommon.

If we consider the frequency of this process in older children, as compared to our findings in infants, it will be seen that in the former cavitation is not only more frequent, but follows the rule applying to adults. The usual explanation of this condition is the greater resistance offered as the child grows older, allowing the process to become of a more chronic nature, and thus giving mixed infections greater opportunity.

The ages of the cases, under two years of age, with tuberculous cavities, at the Children's Hospital, were as follows:

Five months old	1 case.
Six months old	4 cases.
Seven months old	1 case.
Eleven months old	1 case.
Twelve months old	1 case.
Fifteen months old	2 cases.
Seventeen months old	1 case.
Nineteen months old	1 case.
Total	12 cases.

2. Pathology of the Condition.—In considering the pathology of tuberculosis at this age, a brief résumé of the types of lesions may be of some value. It is not our purpose, however, to consider in detail these various lesions. Briefly, then, the general pathology of tuberculosis at this age may be divided into three types: (*a*) Acute miliary tuberculosis; (*b*) chronic tuberculosis with fibrous changes; (*c*) bronchocaseous pneumonic tuberculosis.

(*a*) *Acute miliary tuberculosis,* or acute disseminated miliary tuberculosis of the lungs, is considered rare by the majority of authors at this early age of life. When it does occur, the miliary tubercles, either gray or yellowish-gray in color, are found scattered throughout both lungs, and to a less extent in other organs of the body. These tubercles vary in size and number according to the degree of infection and the duration of the disease.

(*b*) *Chronic tuberculosis with fibrous changes* in the lungs can be very briefly considered here. This type of tuberculosis at first is generally localized to a small area or areas, and the process is accompanied by the

production of fibrous tissue. The process may consist of caseating areas containing small cavity formations, surrounded by more or less fibrous tissue. Distinct chronic tuberculosis of the lungs with cavity formation within the first two years of life, compared to the adult type of the disease, is rarely found at autopsy.

(*c*) *The caseous bronchopneumonic type* of tuberculosis is the most frequent form of the disease in the lungs at this age. It runs a more or less subacute course, and is almost always fatal. The advanced caseous lesions are usually confined to one lobe, or to one lung, with less marked lesions in the other lobes or lung. In a section of a lung showing tuberculous lesions of this type there are usually large caseous areas with intervening areas of bronchopneumonia, congested lung tissue, or normal lung tissue. The multiple lesions so frequently seen in these cases have their origin from some older process, and are disseminated by way of the blood, the lymphatics, or from the effect of insufflation. They increase in size by peripheral extension, and by the fusion of closely situated smaller areas. This method of extension is especially to be seen when the lesions are near the apposing surfaces of the lobes, and it is not uncommon to see the greater part of one lobe, with the adjacent parts of another lobe, involved in the caseous process. The interlobar pleura in such cases is obliterated by the tuberculous process, or stands out prominently as a fibrous band stretched across the caseous area. It is in these large caseous areas that cavity formation most frequently begins at this age. Cavities are usually the result of acute softening of the central part of the caseous mass, and when this softened area communicates with a bronchus, the fluid parts are thrown off, leaving a space or cavity. The softening of the caseous mass is generally the result of a secondary infection, and is usually due to the streptococcus pyogenes, staphylococcus pyogenes aureus and albus, the micrococcus tetragenus, or the diplococcus pneumoniæ. A pure tuberculous process, as a rule, does not tend to liquefy, it being a drier, harder, and more cheesy process. This in itself would explain the infrequent cavity formation in our group of cases.

In examining the lungs of this type of tuberculosis, one frequently finds small softened areas in these caseous lesions. These have been recorded by some authors as instances of cavities; and in the course of time they in all likelihood would become cavities. We have not included such areas as cavities in our cases, because an ante-mortem excavation had not existed.

The walls of the cavities are usually irregular in outline, and somewhat darker in color than the surrounding lung tissue, especially when the cavity has existed for some time. A distinct communication with a bronchus may be found on some part of the cavity wall, though it may be small and difficult to locate. The size of the cavity varies usually with the chronicity of the case and the size of the caseous lesion. From the microscopical examination

of these cases it would seem that the process is rapid, as the walls of the cavity consist almost entirely of caseous material. Fibrous tissue formation in the walls of the cavity does not take place to any great degree, in this group of cases, compared to the formation of this tissue in the adult.

The fact that in early infancy the tuberculous process in the lung is generally of an extensive bronchocaseous type, running an acute or a subacute course, explains, in part, the absence of fibrous tissue in the lesions. It is a fact that the younger the individual, the more extensive the involvement and the more acute the course. This statement is the result of autopsy examinations, and does not take into consideration the numerous infections with the tubercle bacillus which undoubtedly occur in early life, and are held in abeyance, or cured. As many of these latter cases are not diagnosed, the occurrence of the disease can only be surmised from the widespread prevalence of tuberculosis. It is only in the susceptible cases at this age that the process becomes diffuse, and, after an acute or subacute course, ends fatally. It may also be noted here that in infants dying of tuberculosis the lungs are involved in 100 per cent. of the cases.

3. The Location of the Cavity.—The literature on the subject of the localization of the cavity is not very extensive. The majority of authors state that cavity formation usually takes place in the lower lobes, and generally at the root or central part of the lung. D. Francis Condie says: "There is an important modification that should guide the practitioner when he seeks to determine the existence of a cavern in young children, viz., that under five years of age the cavernous excavation is generally seated in the lower or middle lobes, and is almost confined to one side of the chest." James M. Cooley found cavities in infants much more frequently in the inferior lobes, and most often on the right side. Zuber also found the right lung most commonly affected, and generally only one lung. Both J. Walter Carr and S. Vere Pearson have observed that in infants the usual location of cavities is at the root or central portion of the lobe. Berti and Demme each report cases with a cavity in the lower lobe of the right lung. Fry and Shaw report a case with a cavity in the lower lobe of the left lung. Price-Jones reported an infant with cavities in the same location; but report another case with a cavity in the upper lobe of the left lung. Huguenin reported an infant with a cavity at the apex of the left lung.

Henock reported four cases, as follows:

An infant, 4 months old, right upper lobe (two cavities).
" " 7 " " " " "
" " 8 " " " " " (two cavities).
" " 18 " " both lungs, numerous small cavities.

J. Lewis Smith reported one case at seventeen months, with cavities in both upper lobes.

P. Bennis Green reported six cases as follows:

An infant, 2 years old, summit of right lung.
" " " " " middle lobe of right lung.
" " " " " upper lobe of left lung.
" " " " " lower lobe of left lung.

On the other hand, Eustace Smith says: "The masses situated nearest the apex are commonly the earliest to liquefy, but not always."

Barthez and Sanne, in 77 cases of cavity in infants found:

Cavities within the right lung	47
" upper lobe	34
" middle lobe	9
" lower lobe	16
Cavities within the left lung	51
" upper lobe	51
" lower lobe	18

The location of the cavities in the cases at the Children's Hospital may be tabulated as follows:

Left lung	6
" " upper lobe	2
" " anomalous middle lobe	1
" " lower lobe	2
" " location not specified	1
Right lung	6
" " upper lobe	2
" " middle lobe	1
" " lower lobe	3

To summarize: Upper lobes, 4; middle lobes, 2; lower lobes, 5; location of cavity not specified, 1.

This small table shows the greater frequency of tuberculous cavities in the middle and lower lobes in infancy in our cases. If we consider the location of cavity formation in our own cases, and of those quoted in the literature, it will be seen that the lesion does not occur at the same location as it does in adults. In the majority of cases cavities in infants are deeply seated, and usually at the root of the lung. In our cases cavities occurred more frequently in the lower and middle than in the upper lobes.

4. Of the twelve autopsies performed on cases of tuberculous pulmonary cavities in infants at the Children's Hospital in the last sixteen and three-quarter years, six have come under our personal observation. It is these six cases we desire to report:

Case I.—Lillian R., aged six months, was admitted to the hospital on April 4, 1904. The family history was negative. The infant had been fed at different times on breast-milk, condensed milk, and cows' milk. Although patient had always been a delicate child, she had never had any serious illness. She was taken sick three weeks before admission to the hospital,

with diarrhea, weakness, and sweating at night. Four days before admission developed a cough, coughing severely at times, and became extremely weak. The physical examination disclosed a bronchopneumonia in an emaciated, rachitic infant. The patient became weaker, the bowels continued loose, and the temperature irregular, until the child died, nine days after admission.

Pathological diagnosis: Bronchocaseous pulmonary tuberculosis. Tuberculous enteritis. Tuberculosis of liver and spleen.

The left pleura shows a few tubercles on its parietal surface. The left lung measures 11½ by 6½ by 3 cm. and weighs 70 grams. It is everywhere studded with grayish-yellow tubercles, most of them small (millet-seed), some few attaining to larger size. Portions of the lower lobe are so thickly studded with tubercles as to sink in water. The lung is mottled gray and dark red. The air-contents is especially diminished in the lower lobe. There is hypostatic congestion in the lower lobe and the lower part of the upper lobe. The surface section is granular, moist and glistening, of a mottled grayish color. Crepitation is diminished, while the consistency is firm and tenacious, with a blood-stained fluid exuding. The right lung weighs 108 grams. The air-content is practically absent in the lower lobe, and portions of all three lobes sink in water. The lower lobe is consolidated, but is less thickly studded than the left lung with miliary tubercles. The lower part of the middle lobe also shows pneumonia. The upper part of the middle lobe and the upper lobe show much more thickly scattered tubercles. There is a cavity in the lower portion of the lower lobe posteriorly, containing caseous detritus. The bronchial lymph-glands are everywhere enlarged. There is tuberculosis of the cervical, mediastinal, and retroperitoneal glands. Miliary tubercles in liver and spleen. Also a fatty liver, and chronic follicular colitis.

Case II.—John T., aged fifteen months, colored, was admitted to the hospital on April 5, 1904. The family history was entirely negative. Baby was fed since birth on skimmed milk. Until four days before admission to the hospital he was apparently well. During these four days he had profuse sweating, cough, fever, and evident pain on touching the anterior chest wall. Examination showed a diffuse bronchopneumonia. Infant died three days after admission.

Pathological diagnosis: Caseous bronchopneumonia. Miliary tuberculosis of lungs, pleura, omentum, liver, spleen, and the hepatic, mesenteric, bronchial, and retropharyngeal glands.

The left lung measures 11½ by 7½ by 3½ cm. and weighs 71 grams. The color is mottled gray; the air-contents is diminished in the lower lobe, but in the upper it is normal. In the upper part of the middle lobe there is a cavity 2½ cm. in diameter, surrounded by tuberculous caseous infiltration. The walls of the cavity are irregular and bordered here and there with tuberculous caseous masses. The contents of the cavity are purulent. The pleura directly over the above area is adherent, with recent fibrinous adhesions to the chest wall; on breaking these adhesions the cavity was ruptured. Scattered through the lower lobe, and less in the upper lobe, are many yellow tubercles. The right pleura shows a few pearly tubercles on the parietal layer. The right lung measures 10½ by 8 by 2½ cm. and weighs 49 grams. This lung is not affected except for a number of yellow tubercles.

Case III.—Moses C., aged six months, colored, was admitted to the hospital January 8, 1905. The father and mother are living and well; they have had two children, the patient and one other child, which is dead. The cause of death given was teething (?). The patient had been breast-fed up to the time of admission. He has always been well until three months before coming to the hospital; during these three months the infant had a severe cough, but two days before admission cough became much worse and great quantities of mucus were coughed up. The examination elicited the physical signs of a bronchopneumonia. The temperature was not hectic. In two days after admission the infant died.

Pathological diagnosis: Caseous bronchopneumonia. General miliary tuberculosis. Tuberculosis of liver and spleen and of the bronchial and mesenteric lymph-glands.

The left lung weighs 145 grams. The entire lower lobe and the lower part of the upper lobe is consolidated. There is a large cavity 3 by 2 by 4 cm. in the upper third of the lower lobe posteriorly. It is superficial, and in one place a thickened pleura forms part of the wall. The blood-vessels and bronchi bridge across the cavity and the walls are very irregular and dark in color. A small cavity $\frac{1}{2}$ by $\frac{1}{2}$ by $\frac{1}{2}$ cm. is also found on the lower surface of the lower lobe. There is an extensive obliterative diaphragmatic pleurisy at this location which brings the cavity close to the diaphragm. The whole lower lobe shows advanced caseous pneumonia, and also the greater part of the upper lobe, especially posteriorly. The air-contents is absent, except along the anterior border, and at the apex. On both sides the bronchial glands are very much enlarged and caseous. Miliary tubercles in the liver, spleen, and intestines. The mesenteric glands are caseous. The microscopical examination of a section of lung close to the cavity wall shows diffuse cellular infiltration of tuberculo-pneumonic type. The type of cells present are lymphocytes with a very few polymorphonuclear cells. There is congestion of the capillaries and giant-cell formation. The tissues in the immediate vicinity of the cavity wall show numerous large areas of typical caseation, but there is very little fibrous tissue formation. The large bronchial tubes in the neighborhood show marked bronchitis; the cellular exudate consisting of polymorphonuclear cells and lymphocytes. The walls of the bronchi show the infiltrating process.

Case IV.—Robert W., eleven months old, colored, was admitted to the hospital November 28, 1905. The family history was negative; the mother and father living and well. There was only one other child and it was well. There was no history of tuberculosis in the family. The baby's birth was normal, and up to the time of admission it had been fed exclusively on breast-milk. It had always been well, with the exception of an attack of gastro-enteritis when six months old. For several months before coming to the hospital infant had had a cough, which in the last two weeks had become much more severe. On admission the infant presented the physical signs of a bronchopneumonia. Two days later it became much worse, cough very severe, especially at night. It did not take its feedings well, and the bowels became loose. It began to vomit, and on one occasion the vomited material was streaked with blood. The infant died twenty-two days after admission.

Pathological diagnosis: Caseous bronchopneumonia. General tubercu-

losis. Tuberculosis of liver, spleen, mesenteric and bronchial glands. Tuberculous enteritis and peritonitis. Chronic fibrinous pleurisy.

The left lung weighs 62 grams. It is slightly congested, and shows a slight amount of edema. This lung contains a few scattered, gray, miliary tubercles. The bronchial glands are slightly enlarged. The right lung weighs 205 grams. The whole lung is consolidated; it is firm in consistency and grayish-yellow in color. The surface section is smooth, dry, and dull. There is a cavity at the upper part of the middle lobe, external to the mid-clavicular line. The cavity measures 2 by 1 by 3½ cm. in size. The cavity extends upward into the upper lobe. The walls of the cavity are dark in color and covered with granulations. In the upper lobe there is an excess of fibrous tissue. Over the right lung there is a chronic adhesive pleurisy. There is tuberculosis of the intestines, peritoneum, spleen, liver, appendix, and mesenteric glands. A microscopical examination of a section from the wall of the cavity shows fibrous tissue, and a cellular exudate consisting of polymorphonuclear cells and small lymphocytes. The tissue in close proximity to the cavity wall consists of an overgrowth of fibrous tissue, which extends into the alveolar walls. Embedded in this fibrous tissue there are collections of typical tubercles; they are for the most part small and show a small amount of caseation. Giant-cells are very prominent. The surrounding lung tissue shows the capillaries congested. Wide-spread caseation of the caseo-pneumonic type is not present. The process is a chronic fibro-caseous tuberculosis, with the presence of many giant-cells.

Case V.—Lillian P., one year old, colored, was admitted to the hospital May 27, 1907. The parents were both living and well. There had been no other children. Patient's birth was normal, and until the time of her admission she had been breast-fed. She had never had pertussis, measles, or any contagious disease. Baby had had fever for one month before coming to the hospital. She had been vomiting sour milk immediately after feeding several times a day. The bowels were constipated. For three days before admission she had a number of general convulsions, lasting from five to ten minutes. Examination revealed harsh breathing all over lungs with many large moist râles. She had slight rigidity of neck muscles and a positive Kernig's sign. By lumbar puncture 45 c.c. of slightly cloudy fluid was withdrawn, in which tubercle bacilli were found. Child died forty-eight hours following admission, after having had a number of convulsions.

Pathological diagnosis: Caseous bronchopneumonia. Tuberculous enteritis. Tuberculosis of liver and spleen. Tuberculous meningitis.

The left lung is 10 by 8 by 3½ cm. and weighs 80 grams. The pleura is normal. The surface section of the lung shows numerous small, gray, translucent tubercles, without bronchopneumonia. The tubercles are isolated. There is slight hypostatic congestion in the dependent parts. The lung is crepitant and exudes bloody fluid on pressure. Bronchi and pulmonary vessels are normal. The bronchial lymph-glands are greatly enlarged. The right pleura is congested and thickened. There are firm adhesions from the right upper lobe in the anterior axillary line, and from the middle lobe to the fourth rib. There are adhesions posteriorly over the upper lobe. The right lung measures 13 by 9½ by 3 cm. and weighs 95 grams. Generally

this lung is the same as the left, with the exception of the upper lobe. The upper lobe contains a cavity 1½ by 1½ by 2 cm. situated 1 cm. from the apex; and another cavity below this at the base of the lobe measuring 2½ by 2 by 1 cm. Surrounding these cavities the lung tissue in this lobe is consolidated by a caseous pneumonia. On pressure a muco-pus exudes. The liver shows fatty change and there are translucent gray tubercles distributed throughout. The spleen contains a few gray tubercles. The small and large intestines show numerous tubercular ulcers, especially in the lower part of the ileum. The mesenteric glands are greatly enlarged and some are caseous.

Case VI.—Braxton R., five months old, colored, was admitted to the hospital February 6, 1907. His father, mother, and two sisters are living and well. Infant's birth was normal, and it had never been sick until six weeks before admission. During this time he had a severe cough. Mother states that a dark colored discharge comes from nose during coughing attacks. The physical examination revealed an emaciated colored infant, whose lungs showed numerous moist râles, both anteriorly and posteriorly. A smear made from throat, in order to obtain some expectoration, showed no tubercle bacilli. Heart and abdomen were negative. There was a small amount of blood in the bowel movements. Infant died eleven days after admission.

Pathological diagnosis: Caseous bronchopneumonic tuberculosis. General miliary tuberculosis. Tuberculous pleurisy and peritonitis. Tuberculosis of liver, spleen, kidneys, and intestines. Fatty heart and kidneys. The pleura on the left side is normal, but on the right side there are tuberculous adhesions. The left lung measured 9 by 5 by 3 cm. and weighs 45 grams. The air-contents is greatly decreased and there are a number of large yellow tubercles scattered throughout the lung. The right lung is 10 by 6 by 3.5 cm. and weighs 85 grams. This lung shows extensive pneumonia with many yellow tubercles, and tuberculous infiltration around the small bronchi. Crepitation is absent, the lung is firm in consistency, and the amount of blood is increased. At the right apex posteriorly the pulmonary tissue is broken down, leaving a tuberculous cavity 2 by 1 cm. On the parietal peritoneum are seen a number of discrete yellowish tubercles 3 mm. in diameter, having the appearance of bovine tuberculosis. There are miliary tubercles in the liver, spleen, kidneys, and intestines.

In the six cases we report of cavity formation, all occurred in negro infants between the ages of five and fifteen months old. Our experience bears out the well-known fact that the colored race is especially susceptible to tuberculosis, and the cases autopsied usually showed wide-spread lesions of an advanced type. Miliary tubercles were present in the lungs especially, and to a less extent in other organs. These lesions were usually small, in all likelihood an evidence of a terminal infection, and were secondary to the larger lesions either of the lungs or lymphatic nodes. The bronchial glands were tuberculous in all these cases. The pleura in our cases showed wide-spread adhesions or distinct miliary tubercles.

No data were obtainable, either in the family or personal history of the

cases, which would indicate the source of infection. In only one case had there been any disease prior to the fatal illness. (The exception was an attack of gastro-enteritis in Case IV.) Three of our cases had been fed exclusively on the breast until admitted to the hospital.

The cavity formation in the lungs was with one exception of short duration, and occurred in the larger caseous areas of the lungs, and was not surrounded by fibrous tissue so commonly found in older children. In one case only was the process of longer duration and showed the formation of fibrous tissue around the borders of the cavity.

In conclusion: Cavity formation does not occur with the same frequency in infants as in older children. In our own autopsies 16 per cent. of the infants dying from tuberculosis showed cavity formation—a far lower percentage than reported by other observers. The type of lesion observed by us is not of the variety which lasts long enough to produce cavity formation. The infants usually succumb to the wide-spread process before the larger lesions have time to soften and their contents to be thrown off.

In our cases tuberculous cavities in infants occurred most often at the root of the lungs in the middle and lower lobes.

SECTION IV.

Tuberculosis in Children—Etiology, Prevention, and Treatment (*Continued*).

SECOND DAY. AFTERNOON SESSION.

Tuesday, September 29, 1908.

ABDOMINAL TUBERCULOSIS. TUBERCULOSIS OF THE PERICARDIUM. INTERMITTENT ALBUMINURIA.

The President, Dr. Jacobi, called the Section to order at three o'clock.

THE RELATIVE FREQUENCY OF ABDOMINAL TUBERCULOSIS IN CHILDREN IN GREAT BRITAIN AND THE UNITED STATES.

By David Bovaird, Jr., M.D.,
New York.

In 1901, in the course of an investigation regarding the frequency of primary intestinal tuberculosis in children, there was developed a remarkable discrepancy between the data derived from the hospitals of Great Britain and those of New York. Thus the British statistics gave 18 per cent. of primary intestinal infections against 1 per cent. for New York. It seemed hardly possible that there could be so great a discrepancy, and there was a natural tendency to seek the explanation in differences in methods of examination, rather than to accept the figures as true. During the last few years, observations have been made which show an equal discrepancy in the data regarding the frequency of abdominal tuberculosis, as determined by clinical observations in these two countries; and as it will, I believe, be granted that where primary intestinal tuberculosis is frequent, there abdominal tuberculosis (that is, tuberculosis of the intestines, mesenteric glands, lymph-nodes, and peritoneum) ought to be frequent, or, conversely, abdominal tuberculosis should be rare when primary intestinal infections are

uncommon, it has seemed that the subject is important. If it can be shown that abdominal tuberculosis is much more frequent in Great Britain than in the United States, we shall have corroborative evidence of the remarkable data regarding the frequency of primary intestinal tuberculosis, and shall be, therefore, more ready to accept them as correct; and if correct, these data present a problem in the study of tuberculosis in children the solution of which must have an important bearing on the prevention of tuberculosis in the young.

TABLE I.

SHOWING RATIOS OF ABDOMINAL TUBERCULOSIS AND TUBERCULAR MENINGITIS TO TOTAL ADMISSIONS IN 3 BRITISH HOSPITALS.

ROYAL HOSPITAL FOR SICK CHILDREN. EDINBURGH.

	1897	1898	1899	1900	1901	1902	1903	1904	1905	1906	Average
Number of patients admitted.	1,154	1,219	1,361	1,398	1,533	1,597	1,504	1,596	1,844	2,114	1,532
Percentage of abdominal tuberculosis.....	3.63	3.75	2.57	4.36	2.73	3.63	4.98	3.82	3.14	3.20	3.57
Percentage of tubercular meningitis.....	3.29	2.87	2.42	2.21	2.02	1.63	2.12	1.12	1.57	1.27	2.05

HOSPITAL FOR SICK CHILDREN. GREAT ORMOND ST., LONDON.

	1897	1898	1899	1900	1901	1902	1903	1904	1905	1906	Average
Number of patients admitted.	1,946	2,067	1,962	1,690	2,111	2,236	2,403	2,537	2,876	3,068	2,289
Percentage of abdominal tuberculosis.....	0.66	1.11	1.32	1.71	1.46	1.61	2.03	2.24	2.60	1.98	1.67
Percentage of tubercular meningitis.....	1.49	0.72	1.52	1.88	1.27	1.11	1.16	1.65	1.53	1.85	1.42

ROYAL HOSPITAL FOR SICK CHILDREN. GLASGOW.

	1897	1898	1899	1900	1901	1902	1903	1904	1905	1906	Average
Number of patients admitted.	691	744	741	714	738	854	996	941	1,125	1,075	882
Percentage of abdominal tuberculosis.....	4.05	4.30	3.91	3.92	5.28	4.58	4.32	5.10	5.24	4.46	4.51
Percentage of tubercular meningitis.....	1.49	0.72	1.52	1.88	1.27	1.11	1.16	1.65	1.53	1.85	1.42

TABLE II.

SHOWING RATIOS OF ABDOMINAL TUBERCULOSIS AND TUBERCULAR MENINGITIS TO TOTAL ADMISSIONS IN 3 AMERICAN HOSPITALS (U. S.).

BABIES' HOSPITAL. NEW YORK.

	1900	1901	1902	1903	1904	1905	1906	1907	Average
Number of patients admitted..	395	475	342	610	946	1,036	1,031	979	728
Percentage of abdominal tuberculosis	0.	0.4	0.	0.	0.	0.1	0.1	0.2	0.1
Percentage of tubercular meningitis	0.8	1.2	0.9	0.8	0.9	1.9	3.0	2.0	1.4

CHILDREN'S HOSPITAL. BOSTON.

	1893	1894	1895	1896	1897	1898			Average
Number of patients admitted..	581	675	758	765	910	927	..	..	768
Percentage of abdominal tuberculosis	0.4	0.0	0.4	0.4	0.4	1.0	..	..	0.4
Percentage of tubercular meningitis	1.0	0.3	1.0	2.5	1.5	1.4	..	..	1.3

POST-GRADUATE HOSPITAL. NEW YORK.

	1899	1900	1902	1903	1904	1905	1906		Average
Number of patients admitted..	1,035	979	953	934	1,121	1,111	1,059	..	1,028
Percentage of abdominal tuberculosis	0.5	0.2	0.6	0.2	0.6	0.9	0.6	..	0.51
Percentage of tubercular meningitis	1.5	0.0	0.5	1.1	0.0	0.4	0.4	..	0.56

My interest in the relative frequency of abdominal tuberculosis was aroused by a visit to the Royal Hospital for Sick Children, Edinburgh, in 1904. Under the guidance of Dr. John Thomson, I was shown, in a single morning, more cases of unquestionable abdominal tuberculosis in children than had come under my observation in ten years' work in the dispensaries and hospitals of New York city. Dr. Thomson was impressed by this fact, and published a paper on the subject in the "British Journal of Tuberculosis," July, 1907, giving data from the hospitals of Edinburgh, Glasgow, and London, and contrasting these with such American statistics as he could obtain. I desire merely to present Dr. Thomson's data regarding the hospitals of Great Britain, and to compare them with the returns from American hospitals not accessible to him.

You will observe that, in these data, the total number of children treated yearly in each institution, and the number of cases of abdominal tuberculosis and of tubercular meningitis, are given. The figures for tubercular meningitis are used as an index of the relative frequency of tuberculosis in all forms. As is well known, the meningeal disease may be the terminal event in any form of tuberculosis, and its incidence will probably reflect quite accurately the frequency of tuberculosis in any community. Comparison of the ratios of abdominal tuberculosis and tubercular meningitis will, therefore, show us when, and to what extent, the abdominal type of disease prevails.

TABLE III.

FREQUENCY OF ABDOMINAL TUBERCULOSIS IN GREAT BRITAIN.

Hospital.	Total Number Treated.	Abdominal Tuberculosis.	Tubercular Meningitis.
Great Ormond Street	22,890	382	329
Edinburgh Children's	15,320	547	314
Glasgow Children's	8,820	398	126
Totals	47,030	1327	769

Percentage of abdominal tuberculosis = 3.
Percentage of tubercular meningitis = 1.6
Abdominal Tuberculosis : Tubercular Meningitis :: 2 : 1

TABLE IV.

FREQUENCY OF ABDOMINAL TUBERCULOSIS IN THE UNITED STATES.

Hospital.	Years.	Total Number Treated.	Abdominal Tuberculosis.	Tubercular Meningitis.
Post-Graduate	7	7,222	36	39
Babies', 1888–1901	13	4,554	4	31
Babies', 1902–1907	5	4,944	4	86
New York Infant Asylum, 1894–1900	7	4,098	1	5
Children's, Buffalo, 1892–1900	8	1,151	0	3
Children's, Boston	7	4,616	21	43
Seaside, 1900–1907	7	7,231	5	6
New York Foundling	3	2,875	2	26
Presbyterian	2	610	8	26
Mount Sinai	7	2,266	1	80
Totals	..	39,567	82	345

Percentage of abdominal tuberculosis = 0.21
Percentage of tubercular meningitis = 0.9
Abdominal Tuberculosis : Tubercular Meningitis :: 0.21 : 0.9, or :: 1 : 4.

The most striking feature of these tables is the constancy of the ratios for both types of tuberculosis in each of the hospitals represented. Attention may also be called to the fact that there is three times as much abdominal tuberculosis in Glasgow as in London, if the hospitals quoted may be regarded as typical of conditions prevailing in their respective communities.

If, now, we strike an average for the three cities, we find that these tables give 9.75 per cent. of cases of abdominal tuberculosis to 4.89 per cent. of cases of meningeal tuberculosis, or practically 2 to 1, as representing the conditions prevailing in Great Britain. Alongside these figures, I place similar data from a number of hospitals in the United States. It is at once evident that the figures differ markedly for the several hospitals, and also in the same hospitals from year to year. Desiring to eliminate what must be regarded as the play of chance in the tables, I have dropped the classification of returns by years and massed the statistics from all the hospitals available in Tables III and IV.

There has been no selection of data. The figures for every hospital whose returns were accessible are here given. The contrasts in several instances are striking, but I shall not turn aside to consider them. The figures make it clear that, on the whole, tuberculosis is much less frequent among children in the United States than in Great Britain. They also show that we have, on the average, four cases of meningeal tuberculosis for one of abdominal tuberculosis. Comparing this result with that already obtained for Great Britain, we may safely say that, taking into consideration the frequency of the abdominal localization in cases clinically tuberculous, we find that such localization is eight times more frequent in Great Britain than in the United States. Or, comparing the figures for the hospitals individually, the number of cases of abdominal tuberculosis is found to be four times greater in Great Ormond Street than in the United States; in the Edinburgh Children's Hospital it is about eight times, and in the Glasgow Children's Hospital about twelve times, greater.

If, however, we take the frequency of the two types of tuberculosis in the total number of sick children treated, we see that, on the average, abdominal tuberculosis is fifteen times as frequent in Great Britain as in this country, the figures being 3.25 per cent. of the total number treated in Great Britain and 0.22 per cent. in the United States.

These figures surely demonstrate beyond doubt that abdominal tuberculosis is many times more frequent among children in Great Britain than among those in the United States.

As was said at the beginning of the paper, this fact is of great importance when placed in juxtaposition to the data derived from post-mortem examinations as to the frequency of primary intestinal tuberculosis.

TABLE V.

FREQUENCY OF PRIMARY INTESTINAL TUBERCULOSIS AS DETERMINED BY POST-MORTEM EXAMINATIONS.

In Great Britain	Total Number of Examinations.	Cases of Definite Primary Intestinal Tuberculosis.
Carr	120	20
Woodhead	127	14
Guthrie	77	19
Still	269	63
Ashby	155	20
Shennan	413	100
Totals	1161	236 = 20%

In the United States.	Total Number of Examinations.	Cases of Definite Primary Intestinal Tuberculosis.
Northrup	125	3
Holt	119	0
Bovaird	125	2
Hand	115	10
Foundling Hospital (unpublished)	136	6
Totals	620	21 = 3.5%

We may add that some writers (Sydney Smith) claim that these figures are low, and that 30 per cent. of all cases of tuberculosis in children in Great Britain show a primary intestinal lesion. Here we have the same discrepancy that we found in the clinical data, and it seems to me that, taken together, these figures confirm one another and establish, as thoroughly as need be, the fact that intestinal infection, in tuberculosis of children, is many times more frequent in Great Britain than it is here.

It may also be said that it is probable that a careful investigation would reveal a similar contrast between Great Britain and Germany and France, for the data which I was able to gather six years ago indicated clearly that a general harmony existed between the findings of German and French observers and our own, the data from Great Britain being at variance with all the others. This difference as to the fundamental facts regarding tuberculosis in children particularly, I believe explains the apparently irreconcilable views held by the writers of different nationalities as to the frequency of bovine infections; for, whatever the interpretation of the localization of the lesions with relation to the path of infection, there is general agreement that if infection takes place from milk, it will most probably show itself in tuberculous lesions of the intestines, mesenteric nodes, and possibly peri-

toneum—in other words, abdominal tuberculosis. This fact has been amply proved, for all recent investigations of the type of tubercle bacilli to be found in human lesions show that the bovine type is frequently (70 per cent.) found in cases of abdominal or cervical gland tuberculosis in children, and rarely in other cases.

It is, of course, true that the investigations of cases for types of bacilli have not been numerous enough to be decisive, but the evidence available justifies the statement that when abdominal tuberculosis is common, then bovine infection will be found frequent, and not under other conditions. The application of this proposition to the data I have given is obvious.

Relative Häufigkeit von Bauchtuberkulose in Grossbritannien und den Vereinigten Staaten.—(Bovaird.)

1. Im Laufe einer Untersuchung der Daten bezüglich Tuberkulose bei Kindern in verschiedenen Ländern zeigte der Autor im Jahre 1901 einen bemerkenswerten Widerspruch zwischen den Zahlen für primäre Darmtuberkulose in Grossbritannien und denjenigen der Vereinigten Staaten.

2. Dass dieser Unterschied wirklich vorhanden ist und nicht von der verschiedenen Interpretation dessen abhängt, was in klinischen Daten bezüglich der Bauchtuberkulose bei Kindern in diesen Ländern gefunden wurde.

3. Das Wort "Bauchtuberkulose," wie es hier gebraucht wird, ist so gemeint, um darunter Tuberkulose des Darmes, der Knoten im Mesenterium und des Bauchfells zu verstehen.

4. Daten aus den Hospitälern von Edinburgh, Glasgow und London, verglichen mit jenen aus den Hospitälern von New York und Boston, zeigen:

a. Dass Tuberkulose (alle Formen) in den Vereinigten Staaten viel weniger häufig ist als in Grossbritannien.

b. Dass, wenn man diese Tatsache in Betracht zieht, noch ein wahrnehmbarer Contrast in den die Bauchtuberkulose betreffenden Daten vorhanden ist, welcher zeigt, dass sie viel häufiger in Grossbritannien ist, als in den Vereinigten Staaten.

5. Dass der Contrast genügend gross ist, um zu zeigen, dass manche besondere Bedingungen vorhanden sein müssen, die die ungewöhnliche Häufigkeit der Bauchtuberkulose in Grossbritannien bestimmen.

6. Es mag einigermassen angenommen werden, dass Bauchtuberkulose im allgemeinen die Häufigkeit von primären tuberkulösen Erkrankungen des Darmtraktes und der Nahrungswege wiedergibt.

7. Zu gleicher Zeit taucht die Vermutung auf, dass das Überwiegen der Bauchtuberkulose in Grossbritannien von einem correspondierenden Überwiegen der Rindertuberkulose abhängig sei.

8. Keine solche Daten zeigen sich bei Betrachtung der Rindertuberkulose.

9. Weitere Studien bezüglich der Bauchtuberkulose zeigen, dass diese Affection zum mindesten nicht im Kindesalter (1 bis 2 Jahren) vorkommt, wenn Kuhmilch zumeist als Nahrung verwendet wird, sondern den späteren Lebensaltern angehört.

La frecuencia relativa de la Tuberculosis Abdominal en la Gran Bretaña y los Estados Unidos.—(BOVAIRD.)

1. En el curso de una investigación con relación á la tuberculosis en los niños en los diferentes paises, en 1901, observó el autor la existencia de una notable discrepancia en los resultados de la tuberculosis abdominal en la Gran Bretaña y los Estados Unidos.

2. Que la diferencia es real y no debida á la diferencia en la interpretación de los resultados, es bien demostrada por medio de los datos clínicos con relación á la tuberculosis abdominal en estos paises.

3. El término tuberculosis abdominal, aqui usado, incluye la tuberculosis de los intestinos, glandulas mesentericas y peritoneo.

4. Demostración de los datos obtenidos en el hospital de Edimburgo, Glasgow y Londres comparados con los datos obtenidos en los hospitales de New York y Boston.

a. La tuberculosis (en todos sus formas) es menos frecuente en los Estados Unidos que en la Gran Bretaña.

b. Que tomando en concideración estos datos, aun todavia existe un marcado contraste con relación á la tuberculosis abdominal la cual es mas frecuente en la Gran Bretaña que en los Estados Unidos.

5. Que el contraste es suficientemente grande para demostrar que ciertas condiciones especiales existen las cuales determinan la frecuencia de la tuberculosis abdominal en la Gran Bretaña.

6. La tuberculosis abdominal, puede muy bien presumirse, representa por lo general la infección primitiva del intestino ó del aparato digestivo en general.

7. La suggestión à primera vista es, que la frecuencia de la tuberculosis abdominal en la Gran Bretaña es debida a una frecuencia correspondiente de la tuberculosis en el ganado.

8. Los datos no demuestran una tal preponderancia en la tuberculosis bovina.

9. Estudio de estos resultados demuestran que la tuberculosis abdominal, en este pais á lo menos, no es común antes de la edad de 2 años cuando la leche es el alimento principal sino que es mas frecuente en la edad mas avanzada.

LA PÉRITONITE TUBERCULEUSE DU NOURRISSON.

Par M. E. Weill,
Professeur de clinique infantile à l'Université de Lyon.
et M. Péhu,
Médecin des hôpitaux de Lyon.

Parmi les manifestations diverses que peut affecter la tuberculose dans le premier âge, on peut compter la localisation du bacille sur la séreuse péritonéale. Mais, tandis que de nombreux et importants travaux ont bien fixé la physionomie si particulière de la tuberculose chez le nourrisson, ses formes cliniques, sa localisation sur les viscères, il n'en est pas de même de la tuberculose du péritoine à cet âge de la vie: son histoire compléte n'a pas été tracée encore.

A l'occasion de deux cas personnels il nous a semblé utile de réunir toutes les observations publiées sur ce sujet, et d'écrire, sur la péritonite tuberculeuse du nourrisson, une étude d'ensemble permettant de fixer avec précision les détails nosographiques qui la concernent.

I. L'histoire de la péritonite tuberculeuse chez le nourrisson est fort courte: il n'existe, du moins à notre connaissance, aucune monographie d'ensemble sur ce sujet. Elle est étudiée incidemment à propos des observations sur la tuberculose du premier âge publiées surtout depuis que les travaux de Landouzy et Queyrat ont montré que l'infection par le bacille de Koch était beaucoup moins rare chez le nourrisson qu'on ne l'enseignait jusqu'alors (1883).

Il est superflu de rappeler les anciennes conceptions qui régnèrent, dans les idées médicales, à la fin du xviiie siècle et au commencement du xixe lorsque Baumés (1787) proclama qu'il existe une maladie bien définie comme sous le nom de "carreau", qui résumait à elle seule la tuberculose abdominale chez le nourrisson, la tuberculose entéro-péritonéale disait on à l'heure actuelle. Les vues de Baumés n'eurent qu'une vogue éphémère puisque, dès 1830, Guersant les attaque en contestant l'individualité, à la fois clinique et anatomique du carreau. Ce dernier englobe en effet d'après cet auteur, des faits divers tels que: ulcérations intestinales de nature tuberculeuse, péritonite chronique, les feuillets de la séreuse pouvant être enflammés, rouges, réunis même par des points d'adhérences avec l'intestin. Le démembrement était dès ce moment accompli. Il fut accentué mieux encore il y a quelques années par M. Marfan, qui eut le mérite d'ajouter que, au nom-

bre des causes d'intumescence du ventre: entérite, péritonite chronique, il fallait compter le rachitisme.

Au surplus quand on consulte les premiers travaux des auteurs sur la tuberculose infantile, on ne trouve que peu d'indications sur les particularités que présente cette affection dans les premiers temps de la vie, et moins encore sur la péritonite du nourrisson. Connelé (1829) réunit des observations recueillies dans le service de M. Tadelot, y joint quelques commentaires, mais ne tente aucun essai nosographique. Les cas visent d'ailleurs surtout des enfants âgés de plus de deux ans. Mêmes constatations peuvent être faites dans les publications de Papavoine (1830) qui ne considère pas la tuberculose aux différents âges; dans un tableau récapitulatif il mentionne seulement, sans autres détails: enfants de deux ans au moins. Toutefois cet auteur a le mérite de cette remarque: la diffusion des lésions est la règle dans les tuberculoses du nourrisson: "Lorsque, dit il les tubercules se développent dans le premier âge, ils le font presque partout à la fois dans le cerveau, les poumons, le tube digestif, les glandes lymphatiques la rate, le foie, les séreuses."

Les premiers, Rillet et Barthez, signalent qu'ils ont pu relever 11 cas de péritonite tuberculeuse chez des enfants de un an à deux ans et demi, tout en déclarant qu'elle est plutôt exceptionnelle avant 4 ans. Les ouvrages ultérieurs de Berton (1842) Barrier (1845), puis plus tard Cadet et Ganicourt, d'Espine et Picot, Baginski, Unger etc., n'apportent aucun élement nouveau. C'est plutôt dans des publications concernant la tuberculose du premier âge et postérieures aux recherches déjà mentionnées, de Landouzy et Queyrat que l'on peut trouver des indications utiles; il nous est impossible dans cette communication de les citer en détail. Deux d'entre elles, plus récentes, et specialement consacrées à la thérapeutique médicale ou chirurgicale, de la tuberculose péritonéale sont très riches en documents bibliographiques français ou étrangers: un rapport de M. A. Broca au Congrés de Lisbonne (avril 1906) et un travail très complet de M. Schmid (Jahrb. f. Kind. oct. 1907).

Enfin les traités classiques de ces dernières années s'accordent tous pour reconnaître la rareté de la péritonite tuberculeuse du premier âge. C'est dans ce sens que concluent les articles récents de Marfan, Mery, Weill, d'Espine et Picot (etc.).

II. Si la péritonite tuberculeuse du nourrisson n'a pas davantage appelé l'attention des auteurs il faut en chercher la raison dans ce fait que cette affection est assez rare. Mais encore faut-il s'entendre sur ce point.

On sait que, dans le premier âge, c'est-à-dire dans les deux ou trois premières années de la vie, il est fréquent d'observer une généralisation de la tuberculose à nombre d'organes. C'est ainsi qu'on trouve d'ordinaire des granulations ou des tubercules dans les différents viscères, non seulement au niveau

des poumons, du foie, de la rate, mais encore dans les centres nerveux, et il est de connaissance commune que brûlant les étapes, la tuberculose du nourrisson fait des ravages dans l'organisme tout entier.

Or, si l'on pratique l'autopsie d'un nourrisson atteint de cette maladie, il n'est pas rare de trouver des tubercules, ou mieux encore des granulations au niveau des séreuses pleurale et péritonéale. Cette dernière est souvent lésée en même temps que les viscères abdominaux. Les bébés atteints de tuberculose succombent en effet à une poussée granulique totale, généraliseé; et il est courant, en pareille circonstance, de trouver des semis de granulations grises ou jaunes confluentes dans les feuillets périhépatique, sur la coupole diaphragmatique, autour de la rate, ou encore sur le plancher pelvieu. Les granulations sont à topographie périvasculaire. Si les granulations prédominent au niveau des points précités, c'est probablement parcequ'il y a là des aires de circulation plus ralentie, où les édifications bacillaires peuvent plus facilement être realisées.

Mais là n'est point la tuberculose péritonéale vraie: pour que celle-ci soit constituée il faut que les lésions aient eu le temps de faire de plus importants ravages, qu'il se soit établi des adhérences entre les anses intestinales et le péritoine pariétal, qu'il y ait des lésions intestinales (antérieures ou contemporaines) que se soit constitué une ascite purulente, toutes particularités anatomiques sur lesquelles nous insisterons bientôt. En un mot, il faut que la tuberculose du péritoine se signale cliniquement par une physionomie symptômatique bien tranchée, qu'elle se distingue nettement des autres manifestations bacillaires. À ce titre, mais à ce titre seulement, la tuberculose du péritoine peut être nettement individualisée.

Si l'on se place à ce point de vue, on conviendra que les observations legitimes de péritonite tuberculeuse chez le nourrisson sont plutôt rares. En compulsant des travaux déjà anciens et des publications récentes, nous n'avons pu en réunir qu'une centaine qu'il serait impossible de citer ici dans leur intégrité.

D'ailleurs toutes ne sont pas d'égale valeur. La plupart figurent dans des travaux relatifs à la tuberculose du nourrisson en général, et, à ce titre, l'attention n'a pas été appelée spécialement sur les phénomènes péritoneaux. Les détails cliniques sont assez brefs. D'autres sont plus complètes, et, somme toute, utilisables pour l'étude. Mais, dans bien peu d'entre elles, l'observation pendant la vie du petit malade puis le protocole d'autopsie, sont suffisamment complets. Il nous a paru nécessaire de faire dès maintenant des réserves, concernant le "matériel" utilisable pour la présente étude.

III. Avant d'aborder l'étude clinique de la tuberculose péritonéale du nourrisson, il nous semble utile de décrire l'anatomie pathologique de cette affection.

1. Un fait saillant doit être dégagé. La maladie se caractérise d'ordinaire par des tubercules crus ou ramollis, par conséquent, sous la forme caséeuse. La modalité fibreuse est plutôt rare, à peu près inconnue; cela n'est point pour surprendre, car on sait bien que la tuberculose du nourrisson affecte d'ordinaire cette allure, qu'elle est un "caséie" suivant l'expression de l'un de nous (E. Weill).

Il en découle cette conséquence que la forme ascitique pure, comparable à l'hydarthrose séreuse ou séro-fibrineuse d'une jointure est fort rare dans la péritonite tuberculeuse du premier âge, qu'on y voit au contraire le plus habituellement, des lésions caséeuses d'abord, puis ramollies et ultérieurement envahies par des infections secondaires.

Les altérations anatomiques sont ainsi plus ou moins diffuses suivant l'intensité du processus. Débutant en divers points de la séreuse sur le feuillet pariétal, ou au niveau des replis viscéraux (mèsentère, épiploons) elle amène des coalescences entre le péritoine et les viscères abdominaux, particulièrement avec l'intestin. Ainsi peuvent se constituer des foyers enkystés, ou communiquant avec le reste de la cavité. Ces foyers peuvent même se collecter en certains points de prédilection, l'ombilic par exemple, comme cela est fréquemment observé dans la péritonite de la seconde enfance.

Le contenu de ces foyers est constitué par du pus ou de la sérosité louche. Généralement le pus est floconneux, mal lié, analogue à celui qui résulte des suppurations bacillaires.

Les épanchements abdominaux enkystés ou libres, ne sont pas cependant toujours purulents. Il est parfois possible de retirer un liquide sérofibrineux simple analogue à celui des pleurésies tuberculeuses. L'un de nous a pu suivre ainsi un cas, suivi de guérison, chez un enfant de 20 mois, où la ponction permit d'évacuer un liquide à peu près limpide, de coloration verdâtre, dans lequel la cytologie mit en évidence des lymphocytes en quantité trés prédominante.

2. Les lésions de l'intestin sont assez constantes au cours de la péritonite tuberculeuse du premier âge.

On y peut observer des granulations, des tubercules, ou des ulcérations intestinales qui ne différent pas des altérations bacillaires communes. Assez couramment on note des perforations intestinales, les unes fermées par des adhérences, d'autres baignant dans un foyer suppuré. Il est même souvent difficile de dire, si, en pareille circonstance, les lésions du péritoine sont antérieures ou postérieures à l'ulcération intestinale; car il est parfaitement rationnel d'admettre que l'intestin s'étant perforé, il s'est fait une péritonite secondaire, banale, comme au cours d'une dothienentérie ou dans un processus à caractère ulcératif. Mais la présence de nombreux tubercules sur d'autres points du péritoine permet de trancher la question.

3. Une particularité doit être mise en relief: c'est *la présence, relativement fréquente, de lésions caséeuses dans les organes génitaux des deux sexes.*

Chez la petite fille il n'est point rare de constater la dégénérescence caséeuse du tractus génital: trompes d'abord, ovaires ensuite, utérus. Wolstein (1900) Neter (1903) ont insisté sur ces faits. Même il n'est pas exceptionnel de trouver, concurremment, des lésions externes: ulcère tuberculeux du vagin comme Demme en a publié des exemples (1885 et 1887). Cette trouvaille n'est pas pour surprendre depuis que Cornil a insisté sur la fréquence de la tuberculose génitale et spécialement sur la salpingite caséeuse dans la péritonite bacilliare des adolescents ou des adultes. Cette dégénérescence des trompes est souvent bilatérale. Malgré leur "sommeil physiologique" ces organes peuvent donc être atteints par l'infection tuberculeuse.

Les organes mâles peuvent également être interéssés. Déjà D. Mollière et Augagneur (Dict. Dechambre) avaient signalé la coincidence de la tuberculose testiculaire et du "carreau". Hutinel et Deschamps (1891) ont relevé la péritonite bacilliare dans 4 cas sur 6. La persistance du canal vaginopéritonéal est évidemment une cause prédisposante car, en pareille occurrence, l'infection ascendante gagne le péritoine par le canal déférent. Il se peut également que la tuberculose intéresse les vèsicules séminales ou la prostate; mais le fait est peu fréquent (Broca).

Apropos de ces cas de tuberculose genitale on peut se demander si l'infection péritonéale est primitive ou secondaire; mais comme pour l'intestin, il est assez difficile de résoudre catégoriquement le problème. Il se peut lieu, d'ailleurs, que dans un cas comme dans l'autre, l'infection soit contemporaine et effectuée par la voie sanguine.

4. Enfin, comme au cours de la tuberculose du nourrisson, il est de règle d'observer des altérations diffusées aux autres organes. Le foie, la rate, les reins, les poumons, etc., sont lésés, on y trouve des granulations ou des tubercules. Les ganglions mésentériques ont souvent subi la transformation caséeuse comme d'ailleurs, les ganglions lombaires et médiastinaux. La généralisation des lésions prouve bien que, dans ces conditions, la maladie ne peut guérir. Inversément on peut soupçonner sans l'affirmer toutefois, que, dans les cas curables, la maladie se cantonne au péritoine, et respecte les viscères abdominaux ou thoraciques. L'extension à plusieurs organes fait que la maladie, comme nous l'établirons, a une marche généralement rapide: la chronicité et l'évolution lente ne sont point dans ses allures naturelles; il en résulte qu'on n'a pas observé la dégénérescence amyloïde qui accompagne au contraire, certaines formes tardives, prolongées, de la péritonite bacillaire.

En résumé, la tuberculose du péritoine, chez le nourrisson, se caractérise anatomiquement par la prédominance manifeste de la forme caséeuse,

par la généralisation des lésions et par la coïncidence fréquente de lésions bacillaires dans l'appareil génital masculin ou féminin.

IV. La symptomatologie de cette affection a des caractères assez tranchés pour qu'on puisse sinon affirmer, du moins, soupçonner son existence.

Le début se fait par des phénomènes douloureux qui se traduisent par une expression intermittente de souffrance sur le visage du petit malade ou par une flexion des cuisses sur l'abdomen, comme dans les péritonites du jeune âge. Les parents ont en général, remarqué une augmentation progressive du volume du ventre. Toutefois ce symptôme ne peut être considéré comme ayant une valeur pour le diagnostic, car ces nourrissons peuvent avoir de l'intumescence abdominale par le fait d'un rachitisme ancien et de poussées entéritiques récidivantes. Pour que ce symptôme soit pris en sérieuse considérations, il faut qu'il soit très prononcé, que le ventre subisse une augmentation notable; il est superflu de dire que le metéorisme est proportionnel à la quantité de liquide épanché et qu'il est surtout accentué dans les formes ascitiques. Des vomissements, de la diarrhée sont fréquemment mentionnés. L'état général est souvent très précaire, l'amaigrissement progressif.

À la période d'état, la symptomatologie ne diffère pas beaucoup de ce qu'elle est dans les péritonites tuberculeuses survenant chez les enfants plus âgés. On y trouve en effet l'augmentation de volume du ventre, le metéorisme, la circulation collatérale qui existait nettement dans une de nos observations et qui permit un diagnostic précoce. La diarrhée et les troubles digestifs figurent assez souvent: ils ne sont point constants cependant, la diarrhée paraissant en effet dépendre des lésions intestinales concomitantes.

L'examen direct dénote quelquefois de la douleur à la palpation; mais cette dernière est atténuée dans la majorité des cas. On peut noter du flot utéral et lombo-abdominal (signe de Bard). Parfois l'ascite étant cloisonnée on n'obtient pas de modification par les changements de position du petit malade. Si l'épanchement abdominal n'est pas trop abondant ou pourra percevoir une sensation d'empâtement diffus, assez rarement des gâteaux abdominaux comme dans la péritonite des adolescents. Widerhofer, cité par M. Marfan, prétend qu'on peut senter sous la peau du ventre et sur le trajet des lymphatiques de petits noyaux durs, roulant sous le doigt, et qui seraient des ganglions lymphatiques tuberculeux.

Un symptôme parfois rencontré, et qui aurait, d'après Vierordt une valeur diagnostique assez grande, est l'écoulement vulvaire de nature purulente: il pourrait, il est vrai, être causé par une ulcération tuberculeuse des grandes lèvres sans que, pour cela le péritoine soit atteint.

Le toucher rectal ne doit pas être oublié; il renseignera parfois sur l'existence de lésions périuréthrales, au niveau de la prostate ou des vesicules séminales.

Dans la majorité des cas l'affection est apyrétique, comme d'ailleurs dans la tuberculose du nourrisson. Cependant ce symptôme ne paraît pas avoir été suffisamment recherché: il n'est en général pas mentionné dans les observations que nous avons pu compulser.

Enfin: parmi les signes caractéristiques de l'affection, il faut citer l'existence d'une fistule ombilicale. On connaît les tendances qu'ont les suppurations abdominales, de nature tuberculeuse, à se deriger vers l'ombilic. À ce niveau la peau rougit, l'oedématie, puis la collection s'ouvre à l'extérieur; laissant une fistule persistante par laquelle s'écoulent ultérieurement du pus et, même des matières fécales—Schrötter (1903) insistait récemment sur ces faits auxquels il a consacré une importante étude.

Avec ces signes locaux, on note à distance des phénomènes très significatifs: des ganglions périphériques peuvent être envahis par la tuberculose et se présenter sous la forme de tuméfactions appreciables au niveau du cou, des aines et des aisselles. Le foie, la rate sont souvent hypertrophiés. L'examen des poumons n'est pas toujours positif, car on sait qu'à cet âge de la vie, l'auscultation ne révèle pas des signes très probants. Les petits malades sont souvent porteurs d'écoulements d'oreille qui peuvent ressortir à une infection banale de l'oreille moyenne si commune dans les états cachectiques de la première enfance, ou encore à une tuberculose du rocher. La présence de gommes sous cutanées avec leur siége habituel au niveau des fesses ou des members inférieurs n'est d'ordiniare pas mentionnée.

Quant à l'état général il est le plus souvent précaire. Les nourrissons présentent l'aspect de l'atrophie ou de l'athreptie chroniques avec emaciation marquée, peau fletrie et de teinte plombée, excavation des yeux, en un mot avec le cortège habituel et si impressionnant de la grande cachexie.

L'évolution de la maladie se fait d'ordinaire vers la mort, celle-ci survient dans le marasme, ou bien elle est amenée par une infection secondaire souvent à determination broncopulmonaire; ou encore c'est une méningite terminale qui emporte le petit malade. L'affection est en général, assez rapide dans ses principales phases: ce qui est la conséquence de la diffusion des lésions.

Toutefois, la guérison est possible; les formes ascitiques sont curables. L'un de nous a pu observer un an après la maladie, un cas de ce genre dans lequel l'affection caractéristique dans ses principaux symptômes, avait été affirmée par l'existence d'une lymphocytose du liquide d'ascite retiré par ponction. Le ventre avait recouvré toute sa souplesse; l'état général du malade était excellent. Schmidt dans son récent mémoire (1907) a cité plusieurs cas suivis de guérison constatée après plusieurs années. Même les formes caséeuses et suppurées peuvent parfois être curables. Toutefois cette éventualité est plutôt rare; et le pronostic peut être consideré toujours comme sérieux, sinon très grave.

Il est superflu de répéter une fois encore que la diffusion des lésions à plusieurs organes, la possibilité d'infections secondaires constituent des obstacles à une réparation définitive.

V. Si le diagnostic de la péritonite bacillaire est généralement fait dans la deuxième enfance, il n'est pas aussi aisé quand il s'agit du premier âge. A cette période en effet le "gros ventre" est d'une constatation fréquente, presque banale, même, pourrait on dire dans les services d'hôpital. Or, il s'agit d'assigner á cette intumescence abdominale sa véritable cause et le problème n'est pas toujours d'une solution facile.

Apropos de l'historique, nous avons rappelé les discussions anciennes sur la nature vraie du carreau. Baumés l'avait considéré comme du á une tuberculose entéro-péritonéale; mais sa conception n'eut qu'une dureé éphémère puisque un peu plus de 30 ans après ses publications Guersant dèmontrait qu'il s'agissait de cas désparates englobant des faits de peritonite bacillaire, d'entérite á forme ulcéreuse dûe au bacille de Koch et enfin d'adénopathie mésentérique de même nature. M. Marfan (1895) y a ajouté cette notion que beaucoup de gros ventres chez le nourrisson étaient dus à une dyspepsie gastro-intestinale ancienne, avec poussées diarrhéiques, ayant déterminé un allongement atonique de l'intestin dans ses différentes portions. Le démembrement de la pretendue maladie est donc depuis longtemps effectué.

En présence d'un abdomen augmenté de volume, souvent on ne peut s'empêcher de songer à l'existence possible d'une péritonite bacillaire. Certains nourrissons présentent un ventre distendu, faisant un relief considérable tympanisé; s'il s'y ajoute un état cachectique, ou atrophique, l'hésitation est légitime. Cependant le gros ventre des rachitiques présente une sonorité exagérée dans toute son étendue et point la matité déplaçable accompagnée d'un flot latéral ou lombo-abdominal qui est au contraire l'apanage des épanchements ascitiques accompagnant la tuberculose péritonéale. Pas de circulation collatérale. La palpation dénote une résistance généralisée, mais ancune sensation d'empatement ou d'induration partiels, pas de gateaux constatables. L'examen des autres organes est en général négatif: on ne peut faire état des symptômes digestifs surajoutés: diarrhée ou vomissements car ils peuvent exister dans l'une ou l'autre de ces maladies.

Certaines cirrhoses spleno-hépatiques d'origine héredo-syphilitique peuvent en imposer pour une péritonite tuberculeuse à forme ascitique. Cependant elles sont fort rares; car la syphilis amène plutôt de l'hépato ou de la spléno-mégalie sans ascite; l'état de dureté du foie quand cet organe peut être facilement exploré serait évidemment un signe d'une grande importance.

Les différentes formes de péritonite non tuberculeuses ont évidemment

quelques points communs: épanchement abdominal, météorisme, gonflement du ventre, phénomènes douloureux, etc. Le nourrisson, on le sait, est susceptible de présenter des péritonites appendiculaires pneumo-cocciques ou gono-cocciques. Mais l'allure de ces dernières est généralement aiguë, á grand fracas avec invasion brusque ou rapide. La fièvre s'allume plus facilement. La maladie est plus limitée, non diffusée à tout l'organisme. La ressemblance est donc assez lointaine et il suffit, sans y insister davantage, de signaler cette erreur possible.

Assez semblable à celle de la péritonite bacillaire chronique, est la symptomatologie des tumeurs abdominales, du sarcome de certains organes, tels que rein ou intestin. M. Variot (1904) a cru tout d'abord à un néoplasme du rein chez un enfant de 18 mois qui présentait du météorisme à droite, tandis que dans la partie gauche du ventre on sentait une masse dure, male, bosselée et fluctuante par endroits. Dans d'autres cas la confusion a été faite avec une hydronéphrose d'un rein; ou encore avec un kyste congénital de cet organe. Il est certain qu'une semblable erreur peut être commise, comme elle l'est chez l'adulte quand il s'agit d'établir un diagnostic differentiel avec un kyste ovarique. Les éléments qui rendent possible cette distinction nous parraissent être que dans la péritonite tuberculeuse l'empâtement ou les signes de tumeur sont plus diffus et que la matité est déplaçable. Les symptômes concomitants (présence de manifestations tuberculeuses extérieures, sur la peau ou sur les ganglions), l'étude de la courbe thermique sont des éléments de grande probabilité en faveur de la péritonite bacillaire.

Il est beaucoup plus malaisé de différencier la péritonite elle même et la tuberculose intestinale à forme ulcéreuse. S'il existe un épanchement ascitique, il y a beaucoup de chances pour que la séreuse soit intéressée. Mais peut on prétendre que l'intestin n'est pas lésé? Il serait téméraire de l'affirmer: d'autant que les lésions se diffusent facilement de la séreuse à l'intestin, comme en témoignent les autopsies. Quant à l'adénopathie mésentérique, elle n'a pas nous semble-t-il d'existence clinique réelle. Son histoire se confond plutôt avec celle de la tuberculose intestinale dont elle est, *d'ordinaire* la conséquence. Il peut se faire cependant qu'elle se présente à l'état isolé, sous la forme de tumeurs de volume variant de celui d'une noissette à celui d'un œuf de pigeon, perceptibles sous la paroi amincie et flasque de l'abdomen, prédominant à droite au niveau de l'angle iléo-cœcal. Mais en pareil cas, ces tumeurs ne s'accompagnent pas d'ascite, elles sont assez franchement limitées; elles résistent à l'administration de lavements répétés et profondément évacuateurs; et elles ne se revèlent par aucun symptôme fonctionnel s'il n'y a pas de lésions intestinales en activité.

C'est donc, en dernière analyse, surtout avec le gros ventre des rachitiques, avec les tumeurs abdominales que la confusion est possible. Nous

avons indiqué quels sont les moyens dont le clinicien dispose pour arriver à un diagnostic précis.

Il est superflu d'ajouter qu'on ne devra point négliger les procédés de laboratoire: particulièrement la recherche de la formule cytologique du liquide épanché, s'il y a ascite, des bacilles dans les selles, et surtout les réactions générales ou locales produites par la tuberculine: injection sous-cutanée ou intra-dermique de cette dernière, cuti ou ophtalmo réaction, etc.

VI. Sur le traitement de la péritonite bacillaire chez le nourrisson il ne nous paraît pas necéssaire de nous étendre bien longuement. Les indications thérapeutiques sont les mêmes que lorsqu'il s'agit d'enfants plus âgés à quelques varaintes près. La médication interne se réduit à des toniques généraux, comme dans la tuberculose viscérale, d'ailleurs.

S'il s'agit d'une forme ascitique, rarement observée, comme nous l'avons dit, il faudra pour pratiquer une paracentèse se guider sur le degré de distension du ventre. Si celui-ci n'est pas très marqué mieux vaut différer la ponction qui peut soustraire une masse importante de sérosité, d'un déperdition préjudiciable à l'organisme. Mais la paracentèse peut être rendue obligatoire par la distension extrême du ventre, le refoulement des viscères, il faut intervenir comme dans les ascites volumineuses.

Si la tuberculose péritonéale est caséeuse et suppurée la question de la laparotomie se pose; il peut être en effet plausible d'évacuer le pus, de drainer la cavité abdominale; mais l'opération est très grave et les succès fort rare. La proportion de guérisons définitives ou prolongées est minime. Au surplus on est souvent empêché d'intervenir par la cachexie du petit malade, par la généralisation des lésions qui rendent tout acte opératoire dangereux ou inutile.

TUBERCULOSIS OF THE PERICARDIUM IN CHILDREN.

By Joseph S. Wall, M.D.,

Professor of Physiology, Georgetown University; Pediatrist to the Providence and Foundlings' Hospitals; Assistant Physician to the Children's Hospital, Washington, D. C.

Tuberculosis of the pericardium may be encountered as a mere incident in the course of pulmonary or general tuberculosis, with latent symptoms and without lesions of sufficient importance to draw attention to the pericardial membrane as an especially vulnerable part in sharing in the ravages of the disease.

To such types as these some would apply the designation "tuberculosis of the pericardium," whereas the term "tuberculous pericarditis" is restricted to that class in which the evidences of pericardial disease are of such moment as to attract especial attention during life or at autopsy. In fact, it is not infrequently found that the clinical picture of pericarditis is so distinct that other associated manifestations of tuberculosis are masked, and the symptoms are so overwhelmingly cardiac that pericarditis of tubercular origin may be given clinical consideration with about as much fitness as meningitis from a similar cause.

Tuberculous involvement of the pericardium has been encountered in varying proportions by different observers, a very high percentage being claimed by the French writers—one-third of all cases of tuberculosis, according to Chappe, and in smaller percentages by others. Still, in 769 autopsies on children under twelve, found 37 instances of tuberculosis of the pericardium, almost 5 per cent., in subjects dead from general causes. To indicate its frequency in proportion to pericarditis from other causes, Chappe quotes Hamburger, who found 12 cases out of 57 tuberculous; Leudet, 8 out of 36; Weill, 5 out of 24; and his personal observation, that one-fourth are tuberculous.

Tuberculous pericarditis, from its frequency and from its occasional absolute predominance over other lesions in the course of tuberculosis, might be considered a distinct morbid entity, possessing enough differential characteristics to prove an engaging study.

Etiology.

Pericardial tuberculosis makes presumptive the presence of a disease focus elsewhere, of which this malady is the offspring, and those few reported

cases of primary involvement of the sac must have been cryptogenetic, and primary only in the sense that primitive clinical disturbances occurred in this region.

An antecedent history of family tuberculosis is sometimes elicited, and in a majority of cases such precursors as measles, scarlatina, diphtheria, exhausting intestinal maladies, pneumonia, and tuberculous disease of the lungs and pleuræ are seen.

The frequency of measles in the anamnesis of tuberculous pericarditis is marked, and the tendency to tuberculosis of the bronchial glands after this exanthem is strongly suggestive. The cause par excellence is tuberculosis of the mediastinal glands. This adenopathy must be regarded as the source of infection in most cases of tuberculosis of the pericardium, and as the almost certain factor in such as apparently arise *de novo*. Osler has stated that the involvement of the pericardium is the gradual result of inflammation by continuity and contiguity, while Colrat has suggested the mediation of the lymphatics.

The most striking pathological lesions in cases coming to autopsy are those of induration and caseation of the tracheobronchial and peribronchial glands, often with matting of the adjacent structures. The especial liability of children to disease of the mediastinal glands would explain the comparative frequency of tuberculous pericarditis in those of tender years, as compared to adult life.

In the records of reported cases, where the influence of sex was noted, the distribution between boys and girls has been about equal—sixteen males and nineteen females. The age of those affected, when given, has varied as follows:

1 to 3 years	4
3 to 5 years	9
5 to 7 years	4
7 to 10 years	9
10 to 15 years	18
Total	48

Pathology.

The lesions of least magnitude are, naturally, those met in "incident cases," which have given rise to no clinical symptoms before death and are probably often overlooked at autopsy.

On opening the pericardium, its lack of luster may attract attention, and the surface may present an opalescent, sometimes a mother-of-pearl, appearance; in other instances, scattered over a surface not especially lusterless there are areas of a yellowish or milky nature, at times raised above the surface to form plaques not unlike those seen in the aorta in disease of its endothelium.

In the mild types, scattered tubercles, with but little exudate into or on the membrane, are seen studding both visceral and parietal layers. When the process is more virulent, the macroscopic appearances are more pronounced. There are thickening of the pericardium and deposit of false membrane upon its surfaces, the lighter types showing a thin, delicate exudate, milky or yellowish in color, which, in its early stages, may be stripped off with ease and present little hindrance to the separation of the pericardial layers.

In older types, with but little serous exudate, there must arise, in consequence, adhesion of the layers, which are sometimes fragile and yield the "bread-and-butter" pericardium on forcible separation—the so-called villous pericarditis; in other cases, their organization is so firm and dense that separation is impossible.

The site of both exudate and adhesions is, by preference, toward the base, the less mobile part of the heart, for here may be found partial symphysis with apical fluid, and this is, furthermore, explanatory of the basic location of pericardial murmurs, when such are present.

It has been claimed by some that *restitutio ad integrum* can occur when the inflammatory process becomes arrested at an early period, with probably delicate, poorly organized exudates within the sac, but such an outcome must rarely be possible, considering the ordinary march of tuberculous inflammation, which, though less virulent, is more prolonged and tenacious than that resulting from other infections to which the pericardium is liable.

With plastic deposits, there is often extreme vascularity, with resultant liability to hemorrhagic exudates, so frequently seen in tuberculous pericarditis. The tendency to hemorrhage may be further increased if the false membrane is reticulated or lacunar in character, which is not infrequently the structural texture of many deposits. These spaces often contain red blood-cells, resulting from minute extravasations from the newly formed capillaries (Sergent).

Not only is there increase in thickness of the pericardium by successive additions to its serous face by inflammatory exudate, but in the opposite direction, toward the myocardium, there is round-celled infiltration, with increased width of the membrane, so that it may attain a breadth of from five to ten millimeters, or, in long-standing cases, the inflammatory induration may form a dense fibrous sheathing, four to six centimeters in thickness. This enormous thickening is met in conjunction with a like induration of the mediastinal structures, the pleuræ, and, not infrequently, of the capsule of Glisson, and forms, in fact, an anatomical entity, characterized by extensive fibrosis of adjacent and neighboring organs.

The microscopical appearances of a tuberculous pericardium have been

clearly described by Sergent, who has demonstrated marked thickening of the serous membrane and of the subserous tissue, with fibrosis of its constituent arteries and veins. On the parietal wall, the serous layer is separated from the subserous by a zone of embryonal cells inclosing many small vessels. He has also described well the lacunar structure of the fibrinous deposit and the extreme vascularity of the lacunar walls with bloody extravasations into their vacuolated spaces. He was unable to demonstrate the bacilli of Koch in the fibrin, but found them in the serous layer, and, to a lesser extent, in the subserous zone of infiltration. The round-celled zone on the visceral side was particularly wide, vascular, contained some giant-cells, and in some places dipped down into the myocardial tissue, which was fatty in these situations. The bacilli occupied the same regions, by preference, as in the parietal coat.

The extent and the character of the adhesive inflammation of tuberculous pericarditis are full of interest. Should the process be slight, or death occur in the early stages of the disease, or abundant exudation supervene, adhesions are encountered which are of little extent, are recent, delicate, and fragile in nature, easily torn through, and are sometimes in evidence only at the basic regions of the heart.

In cases of longer duration, in which the tuberculous process is more virulent and intense, and in those which embody an almost distinct type of adhesive inflammation, the agglutination of the pericardial surfaces may be extensive and not rarely complete—an actual symphysis of the layers. In such an event the surfaces, even when completely adherent, can be separated by gentle traction, as reported by Teissier; often, however, the welding is absolute, so that isolation of the leaflets, even by careful dissection, is impossible.

Symphysis of the pericardium is a termination of adhesive inflammation, as well as the initial factor in pathological changes in the heart and adjacent viscera. In conditions of complete fusion, which are those usually of extensive plastic exudate and subsequent fibrosis, the heart is incased in a veritable sheath, which, of necessity, greatly interferes with its normal functional activity. It is usual, therefore, to find the heart itself small, atrophied rather than hypertrophied, although the latter condition has been observed in some cases (Boisson, Boutavant, Mircouche, quoted by Chappe). This decrease in size must be incident to two factors, namely, the dynamic limitation by the inhibiting sheathing and the actual interference with the cardiac nutrition because of involvement of the coronary arteries, fibrosis and narrowing of these structures having been frequently reported. The myocardium is frequently flabby and fatty, and at times is tuberculous contiguous to the pericardial investment, but not elsewhere.

Pericardial symphysis causes encroachment upon the lumen of the large

veins, with obstructive congestion of the viscera, most notably seen in the liver. When the adhesive type of disease causes or accompanies similar changes in adjoining parts, the pericardium, pleuræ, mediastinal structures, glands, vessels, and nerves may be completely matted together in a mass of fibrous tissue—the mediastinopericarditis of Kussmaul. This agglutination may extend from the diaphragm to the thoracic apex, and from the sternum in front to the vertebral column behind, as was especially noted in one of Dubard's cases. Traction by newly formed fibrillar tissues may be responsible for dislocation of the heart, most frequently toward the right, because of the predominating influence of mediastinal inflammation.

One is struck by the frequency of valvular lesions in tuberculous pericarditis. Vegetations are not rare upon the mitral and tricuspid valves, and Dubard has noted vegetations of an actual tuberculous character within the right auricle itself.

The effusions into the pericardium vary greatly in amount, from a few cubic centimeters to as much as a liter (Roger, Richardier and Teissier, Sergent, Dubard). In most cases the fluid exudate is moderate in amount, does not usually undergo the variations in quantity noted in rheumatic types, and differs from the latter in frequently being hemorrhagic, a characteristic readily explained by the structure of the vegetations. With large serous effusions one is likely to encounter similar bulky exudates in the pleural and peritoneal cavities, a group of kindred phenomena almost as frequent as the concomitant adhesive inflammations of these structures.

Of especial importance from an etiological standpoint is the constant adenopathy of the mediastinum. In this locality the tuberculous tracheobronchial and peribronchial glands may be few and isolated, or, there may be such extensive agglutination that the term mediastinitis may be fitly applied to it. Infection and degeneration of these glands is the primary macroscopical focus of disease in the majority of cases of tuberculous pericarditis, the atrium of the tonsil, rhinopharynx, bronchial mucosa, and the intermediation of the cervical lymph-glands are etiological steps of importance in tracing the participation of the pericardium in the tuberculous process. In no case reviewed in the literature, where examination of the mediastinal glands was made, was evidence of tuberculous inflammation lacking.

Of next importance are pleural tuberculosis and extension by contiguity to the pericardium. In the literature examined the pleuræ were almost constantly tainted by the tuberculous process, and the lungs without exception. The initial lesion in the lungs frequently usurps the mediastinal inflammation as the causative factor in the pericarditis of the disease in question.

Autopsy may disclose general miliary tuberculosis, with involvement of

the spleen, liver, kidney, peritoneum, and brain. The liver rarely escapes, and may present features of disease that are more or less characteristic when in association with tuberculous pericarditis, and especially when this process results in symphysis of the leaflets. Hutinel describes a "foie cardio-tuberculeux," which is large, passively congested, with fatty cirrhosis and tuberculous infiltration. An obstructive cirrhosis is the rule in symphysis, although at times the perihepatic capsule bears the brunt of the disease and participates in the general fibrosis.

In the abdominal cavity caseation of the retroperitoneal glands and intestinal ulceration have been noted—the latter by Sergent and in Case I of my own.

Symptomatology and Diagnosis.

We have referred to the latency of this affection, and would again emphasize its quiescence, even where very extensive effusion has occurred. But here again the frequency with which tuberculosis of this sac will be recognized must depend largely on the skill of the observer, who will undoubtedly recognize tuberculous pericarditis in a larger proportion of tuberculous children when he knows of its frequency, and is able to appreciate its physical signs.

Aside from those cases which are recognized only at autopsy, because of their obscurity during life, there are types of pericardial disease that draw attention to the heart even in cursory examinations. In the dry forms, without permanent adhesion of the leaflets, the physical signs are sufficiently marked to attract attention in many instances. The palpatory friction can often be made out and confirmed by the more frequent pericardial rub, which is sometimes soft, simulating a murmur, and at other times distinct and characteristic—creaking, the *bruit de cuir neuf* of the French, and to and fro, coincident with the cardiac cycle. Sears points out the necessity of examining the back of the chest, and reports an instance where a murmur, very feeble in front, was pronounced just above and inside the angle of the left scapula behind.

In the event of effusion, these physical signs gradually abate and are replaced by others significant of fluid in the sac. The elasticity of the thoracic wall in childhood may permit distinct bulging in cases of large accumulations of fluid, with which is associated increase in the cardiac dullness, or even flatness, extending to the left of the nipple and to the right of the sternum, especially in the sternohepatic angle, as indicated by Rotch.

Weill has pointed out an important sign which is sometimes present, namely, the impulse shock being felt or seen to the inner side of the left border of flatness, as determined by percussion. At times there is a wave-

like, undulatory impulse in the precordial region, covering two or three interspaces. Arhythmia, embryocardia, and gallop rhythm are common.

The effusion of tuberculous pericarditis is often masked by the presence of fluid exudates in the pleuræ, especially the left, and even after careful examination in the knee-chest position one cannot speak with certainty concerning the location of the exudate. The diminution of intensity and distant character of the valve sounds are observed in the presence of large effusions.

Symphysis of the leaflets may be devoid of any physical signs of specificity, yet in long-standing cases the general picture may lead to a correct diagnosis, and even to the differentiation of tuberculous from rheumatic symphysis. So far as the heart is concerned, signs of marked cardiac mischief, with but little enlargement and even diminution in size, retraction of the apical region during systole, lowered arterial pressure with evidences of increased pressure in the veins, and cardiac crises may signify welding of the serous surfaces. When obstructive effects supervene, there is marked enlargement of the liver, which is smooth and painless; ascites develops, the abdominal veins become prominent, and enlargement of the spleen, with insufficiency of the kidney and albuminuria, occur secondarily.

The general symptoms are progressive asthenia, precordial pain, dyspnea, which may be intense and compel a sitting attitude, and fever, which is usually of the irregular type, often accompanied with profuse sweats. Concomitant tuberculous lesions elsewhere may be responsible for the temperature.

The pulse is so frequent as often to attract attention to the heart, and with the further suspicious presence of dyspnea, the observer should be able to find the signs of tuberculous pericarditis. The pulsus paradoxus is often encountered.

Brown points out that when edema of the face comes on rapidly in pericardial effusions, the prognosis is very grave. Death not infrequently occurs from disease of other organs, especially of the lungs and meninges.

Prevention and Treatment.

Treatment is, in reality, reduced to prevention, and this is to consist of that especial care of the growing child in health and in disease, by which his resistance to tuberculous infection is heightened, and his ability to recover, when infected, is enhanced. The encouraging results of the open-air treatment of tuberculous lesions elsewhere than in the lungs, especially of gland tuberculosis, as practised by Halstead and others, will save the life of many of those who harbor the initial focus capable of giving rise to the disease in question. Should latent tuberculosis be proved or suspected, should the refined diagnostic technic of Calmette, Moro, or von Pirquet

be further developed, many little ones would be saved, through preventive measures, from death by tuberculous pericarditis and meningitis, so often the fruit of seed sown and propagated in the mediastinal glands.

The care of convalescent children should engage our earnest attention, for too often these little ones are sent from our hospitals to unsanitary homes, placed amid vile surroundings, where they may, in their debility, prove an easy prey to the tuberculous poison.

There are on record cases in adult life that have been treated by aspiration, sometimes frequently repeated, with apparent recovery.* For purposes of record, the following two observations of tuberculosis of the pericardium are reported:

Case I.—A female infant of two months was admitted to the Foundlings' Hospital. Family and antecedent history unknown. From the date of its admission it had an exhausting chronic intestinal indigestion, and about six weeks before death there were cough and fever and, for two weeks, difficulty in breathing. Examination revealed consolidation of the left upper lobe and dullness down to the nipple line, where it became continuous with the cardiac dullness. Von Pirquet's test was positive.

On autopsy there were found tuberculous degeneration of the mesenteric and bronchial glands, some tubercles in the spleen, liver, and lungs, the left lung showing in its upper portion consolidation with small cavity formation. There were two large ulcers in the jejunum. The pericardial sac contained about 100 c.c. of yellowish fluid. The leaflets were thickened, and minute tubercles were scattered upon their surfaces.

Case II.—A boy of five was admitted to the Children's Hospital May 22, 1908. His previous history showed that he had had measles two years ago, followed by pertussis. He was admitted with cough, abdominal pain, and asthenia. Examination revealed dullness on the right side anteriorly, with bronchial breathing and a few râles. The left side behind showed some dry râles.

There were bulging of the precordium and increase in the extent of cardiac dullness, but no murmurs nor rubs. The apex-beat could be felt and was displaced outwardly.

June 8th: Persistent cough and complaint of pain below the precordium. Pulse 158, thready and small. Dyspnea is now a prominent symptom.

June 15th: Labored breathing, general condition unchanged.

June 21st: Dyspnea intense, requiring a constant sitting posture.

June 28th: Progressive exacerbation of symptoms; marked bronchial breathing over lower part of right lung; great increase in heart dullness; enfeeblement of the valve-sounds; edema of the face. Death occurred July 2d.

Autopsy revealed extensive tuberculous lesions in the lungs, liver, and spleen. The mediastinal glands, especially those in proximity to the roots of the great vessels, were caseous, matted together in a mass of adhesions, and at this point showed the intensity of the tuberculous infection. The pericardium was enormously distended with fluid, was thickened and

* Sabin, Amer. Med., Phila., 1902.

infiltrated to a degree about its insertion around the great vessels, and presented scattered tubercles upon the serosæ.

In this child the clinical disturbances incident to the tuberculous pericarditis were overwhelmingly predominant, even in the presence of rather extensive disease of the lungs.

BIBLIOGRAPHY.

Ashby: Brit. Med. Jour., London, 1891, 2, 1208.
Aviragnet: Thèse de Par., 1892.
Batte: Pediatrics, New York, 1901, 328.
Baumel and Abadie: Montpellier Med., 1901.
Brackmann: "Ueber tub. Perikard. bie Kind.," Göttingen, 1888.
Brown: St. Barth. Hosp. Rep., London, 1906. xli, 115.
Chappe: Thèse de Par., 1903 (27 cases and extensive bibliography).
Dubard: Thèse de Pelthier.
Hudelo: Bull. Soc. Anat. de Par., 1888, lxiii, 1024.
Hutinel: Rev. des Mal. de l'enfance, 1893, 1894.
Longues: Bull. Soc. Anat. de Par., 1889, lxiv, 611.
Morison: Lancet, London, 1906, 11, 209.
Netter: Bull. Soc. Anat. de Par., 1889.
Osler: Amer. Jour. Med. Sci., 1893.
Peyre: Thèse de Par., 1893.
Ramsey: St. Paul Med. Jour., 1903, v, 675.
Schmneker: Wien. med. Woch., 1883.
Sears: Bost. Med. and Surg. Jour., 1897, cxxxvi, 383.
Sequiera: Trans. Path. Soc. London, 1896, xlviii, 41.
Sergent: Soc. Anat. de Par., 1893.
Still: Pediatrics, New York, 1901, xii, 332.
Thayer: Maryland Med. Jour., 1903, xlvi, 123.
Bury: Brit. Med. Jour., December, 1891.
Richardier and Teissier: Annal. de Med. et Surg. Infant., Paris, 1904.

DES ALBUMINURIES INTERMITTENTES DE L'ENFANCE CONSIDÉRÉES DANS LEURS RELATIONS AVEC L'HÉRÉDITÉ TUBERCULEUSE.

Par le Docteur J. Teissier,
Professeur de Clinique médicale à l'Université de Lyon

L'hérédité tuberculeuse peut frapper le rein chez l'enfant ou chez l'adulte suivant une triple modalité :

1. Chez certains sujets, il existe une albuminurie plus ou moins abondante, de préférence intermittente, pouvant affecter un des cycles classiques connus, mais qui, disparaissant à mesure que les localisations pulmonaires s'établissent ou se généralisent, mérite le nom d'albuminurie prétuberculeuse.

Cette albuminurie n'implique pas nécessairement l'existence d'une tuberculose rénale. Elle nous semble, au contraire, répondre à une origine toxinique et relever de la bactériolyse qui traduit les moyens de défense spontanée de l'organisme. Lorsque cette destruction spontanée cesse de se produire, la tuberculose évolue et l'albuminurie cesse.

2. Il existe d'autre part, une tuberculose rénale primitive isolée, ou associée à des déterminations vésicales de même nature et dont l'évolution classique est bien connue.

3. Enfin, dans une troisième série de faits—série de beaucoup la plus nombreuse—le rein est impressionné d'une façon tout particulièrement intéressante et qu'une longue suite de faits similaires nous a permis de déterminer avec un degré de quasi certitude : le rein après avoir subi l'action de la toxine tuberculeuse transmise par voie ancestrale, a réagi lentement, sourdement, et il s'est constitué ainsi un léger degré de néphrite latente, qui a abouti à une imperméabilité très-relative, laquelle se traduit par une diminution légère de la diurèse moléculaire totale, une élévation du coefficient $\frac{\Delta}{\delta}$ de Korani, une surélévation légère aussi, de la pression artérielle; une albuminurie d'intensité moyenne, généralement intermittente, à type matinal ou franchement orthostatique, et enfin, comme signature même de l'origine tuberculineuse des accidents, une séro-réaction d'Arloing-Courmont extrêmement nette, et dépassant souvent l'agglutination au $\frac{1}{15}^{\circ}$. Ces cas, qui dans nos statistiques dépassent 34 pour cent des faits d'albuminurie

intermittente des jeunes sujets, n'évoluent pas vers la tuberculose confirmée. Pour cette raison, ils nous semblent meriter et justifier la dénomination d'albuminurie paratuberculeuse—et pour plusieurs d'entre eux, rentrer dans le cadre de ces immunisations spontanées sur lesquelles le professeur Calmette attire à l'heure actuelle toute l'attention.

Les propositions ci-dessus qui peuvent servir à la fois de prémisses et de conclusions à notre communication, mériteraient chacune des developpements importants. Je n'insisterai pourtant que sur la troisième parce que les faits qui s'y rattachent sont les moins connus et qu'ils sont susceptibles au point de vue pratique de considérations très dignes d'intérêt.

C'est d'abord leur très grande fréquence, puisque plus du tiers des albuminuries de l'enfance reconnaissent une semblable étiologie.

C'est ensuite la discordance souvent frappante entre le bon aspect général du patient, parfois d'apparence robuste, sans manifestation morbide notable sur aucun viscère, qui présente une pression artérielle plutôt forte (de 16 à 18 cm.) fait absolument exceptionnel dans la tuberculose où l'on relève en général une pression radiale au-dessous de 13 cm. et qui n'a d'autre stigmate humoral permettant d'affirmer l'imprégnation toxinique que la propriété extrêmement marquée du sérum sanguin à agglutiner les cultures homogènes du bacille de Koch, préparées par notre éminent collègue, le Professeur Arloing.

Mais alors, si l'on fouille les antécédents familiaux de pareils sujets, on arrive toujours à déceler chez eux une hérédité tuberculeuse plus ou moins chargée et contre laquelle ils se sont prémunis par une vie bien règlée, une hygiène excellente ou une résistance individuelle très remarquable.

J'observe en ce moment la troisième génération d'une famille de tuberculeux où deux enfants sur quatre, issus d'un père tuberculeux dont la mère fut elle-même tuberculeuse et qui, à un moment contamina sa femme, eurent de l'albuminurie intermittente, manifestation certaine de l'influence constitutionnelle familiale (et qui sont guéris d'ailleurs) et dans la propre descendance desquels, je trouve deux enfants albuminuriques intermittents et quatre d'entre eux avec une séro-réaction tuberculeuse très positive. Dans toute cette famille, comportant plus de 15 membres, il n'y a aucun sujet manifestement infecté et la majorité présente la réaction d'agglutination d'Arloing-Courmont très développée. Je pourrais citer de nombreux faits analogues et qui sont presque tous moulés sur ce même type: des grands-parents encore vivants ayant eu des manifestations tuberculeuses certaines mais aujourd'hui éteintes, ou bien morts jeunes de tuberculose souvent rapide; des parents, la mère en général, parfois et assez fréquemment des oncles ou des tantes, avec des tuberculoses localisées ou atténuées (tuberculose vésicale, testicule tuberculeux, lupus....) et qui ont eux-mêmes de l'albuminurie intermittente mais avec une séro-réaction très positive. Ceux-là guérissent au bout

d'un certain nombre d'années, parce qu'ils ont reçu (cela me semble très vraisemblable) avec les toxines qui ont touché leur rein, les antitoxines qui les ont préservés ou immunisés.

C'est ce qui nous fait admettre cette conception sûrement très soutenable, que l'hérédité tuberculeuse peut n'avoir influencé la descendance que sous forme d'imprégnation toxinique.

J'ai pu me rendre compte de cette imprégnation de tous les tissus et de toutes les humeurs chez une ancienne malade de mon service, malade que nombre de mes collègues ont examinée—la jeune Marie M...., atteinte de dextrocardie avec double rétrécissement mitral et pulmonaire et qui, à plusieurs reprises, présenta une série de manifestations pleuro-pulmonaires, cérébrales, méningéales et péritonéales que chaque fois on eût tendance à imputer à la tuberculose. Mais toutes les humeurs, vingt fois examinées, ne présentent jamais un seul bacille, mais toujours une séro-réaction positive, qui atteignait souvent un taux inaccoutumé, et chaque fois la malade sortait victorieuse de ses crises. Elle finit pourtant par succomber à une attaque d'asystolie. Or les recherches nécroscopiques faites avec la plus extrême attention ne permirent pas de retrouver la trace de la moindre granulation tuberculeuse.

L'existence des faits en eux-mêmes ne parait donc pas contestable: le grand intérêt clinique consiste dans la faculté de les reconnaître et de les isoler des cas similaires.

Or chez les enfants, à moins des faits de néphrite résiduale post-scarlatineuse, ourlienne ou typhique qui peuvent entraîner un certain degré d'imperméabilité rénale et retentir sur la circulation centrale et augmenter le degré de la tension artérielle, les albuminuries d'ordre fonctionnel (cyclique, digestive, orthostatique pure ou associée) se caractèrisent par une grosse élévation de la diurèse moléculaire, l'abaissement du coefficient $\frac{\Delta}{\delta}$ une diminution notable de la pression artérielle, souvent la mobilité d'un rein ou des deux reins comme dans les faits de Sutherland. Enfin la faculté d'agglutination du sérum sanguin vis-à-vis des cultures de bacilles tuberculeux est négative ou à peine ébauchée.

Chez les sujets toxinisés, au contraire, qui présentent la séro-réaction très développée, la diurèse moléculaire reste au-dessous de 3.000 (chiffre faible pour des adolescents) et le coefficient $\frac{\Delta}{\delta}$ varie entre 1,60 et 1,80. Donc légère imperméabilité, mais imperméabilité certaine. Le léger degré d'hypertension relative qui l'accompagne oscille de 14 à 17-18, chiffre évidemment rarement noté dans les albuminuries intermittentes communes de l'enfance généralement accompagnées de tendance dépressive.

Nous avions déjà en 1905, au Congrès international de la tuberculose à Paris, et plus tard, à Gênes, au Congrès de Médecine interne tenu en oc-

tobre 1905, insisté sur quelques unes des ces distinctions fondamentales. Les faits que nous avons recueillis depuis n'ont fait que confirmer notre opinion. Pas un de nos petits malades n'a eu de manifestations même suspectes de tuberculose, et nous sommes disposés à croire que la plupart d'entre eux marche vers l'immunisation temporaire ou definitive. C'est une conception que nous avions timidement formulée au Congrès de Paris et sur laquelle nous insistons avec plus d'assurance aujourd'hui.

Ce que nous venons de dire pour le rein, nous pourrions le répéter sans doute pour une série d'autres manifestations ancestrales d'ordre toxinique (comme le rétrécissement mitral pur, certains cas d'entero-colite, etc.) qui pourraient constitiuer le groupe des manifestations paratuberculeuses.

L'avenir se chargera de démontrer le bien-fondé de pareilles assertions qui nous semblant d'autant plus soutenables que nombre de faits qui nous intéressent sont tout à fait assimilables avec ceux sur lesquels M. Calmette se fonde pour défendre l'idée de l'immunisation spontanée à la suite des infections tuberculeuses légères ayant frappé pendant l'enfance l'appareil entero-mésentérique ou les glandes lymphatiques du groupe trachéo-bronchique.

Un de nos petits malades conserve de l'albumine intermittente cyclique pendant quatre ans: il guérit, mais á l'albuminurie disparue, succède une poussée de mésentérite suspecte. Repos, séjour à la mer, suspension des études. Il guérit encore. C'est aujourd'hui un officier distingué, qui a fait des campagnes lointaines: ces accidents remontent à plus de vingt ans et il est en parfaite santé. Ne peut-on pas le considérer comme spontanément immunis?

Assurément la preuve expérimentale ne peut en être fournie. Mais au nom de la Clinique, on est autorisé à la considérer comme infiniment probable.

Travaux du Professeur J. Teissier (de Lyon) relatifs aux néphrites et aux albuminuries.

1. "Albuminurie intermittente cyclique (maladie de Pavy-Teissier)," Association francaise pour l'avancement des Sciences, Grenoble, 1884. Cf. aussi Bulletin médical, 1884.
2. "Albuminurie prétuberculeuse," Congrès de médecine interne, Lyon, 1894.
3. "Albuminurie hépatogene," Leçon clinique in Semaine médicale, 1899.
4 "Albuminurie orthostatique," Leçon clinique in Semaine médicale, 1899.
5. "Néphrites paludéennes," Congres international de Médecine, Le Caire, 1902.
6. "Classification et valeur pathogénique des albuminuries orthostatiques," Revue de Médecine, avril, 1905.
7. "Les néphrites résiduales," Leçon clinique Bulletin médical, 1904.
8. "Traitement des néphrites et opothérapie," Bulletin médical, 1904.
9. "Albuminurie et hérédité tuberculeuse," Congrès de la Tuberculose, Paris, 1905.
10. "Albuminuries acéto-solubles," Province médicale, 1906.
11. "Les Albuminuries curables," Un volume de la collection des Actualités médicales, J. B. Baillière, editeur, 1900 and 1907.

Intermittierende Albuminurie in der Kindheit in ihren Beziehungen zu erblicher Tuberkulose betrachtet.—(TEISSIER.)

Erbliche Tuberkulose kann die Nieren des Kindes oder des Erwachsenen auf eine von *drei Arten* befallen:

1. Gewisse Individuen zeigen eine mehr oder weniger reichliche Albuminurie, welche vorzugsweise intermittierend ist und einen der wohlbekannten klassischen Kreise affizieren mag; sie verschwindet aber, sobald die Beschränkung auf die Lungen hergestellt ist oder gibt Anlass zu allgemeinen Verletzungen und mag daher als *prätuberkulose Albuminurie* bezeichnet werden.

Diese Form von Albuminurie zeigt noch nicht das Vorhandensein von Nierentuberkulose an, sondern scheint im Gegenteil einen toxischen Ursprung zu haben und ähnelt der Bacteriolyse, welche ein Ausdruck der spontanen Verteidigungsanstrengungen des Organismus ist. Sobald als diese spontane Zerstörung aufhört, entwickelt sich Tuberkulose und die Albuminurie kommt zum Stillstande.

2. Die zweite Form der Tuberkulose ist durch den Übersetzer ausgestrichen worden.

Endlich haben wir eine dritte Serie von Fällen, die viel zahlreicher sind. Die *Niere* ist in einer eigentümlichen Weise affiziert, die wir durch eine lange Serie ähnlicher Beobachtungen beinahe mit Sicherheit bestimmen konnten. Die Niere reagirt sehr langsam und schwerfällig auf die Wirkung des tuberkulösen Toxins, das durch die Eltern übertragen ist, und es ist ein leichter Grad von latenter Nephritis hervorgerufen, welcher in einer sehr relativen Unzuverlässigkeit resultirt und sich durch eine mässige Verminderung der totalen Moleculardiurese beruhigt, und durch ein Wachsen in dem Coefficienten und auch in einer leichten Steigerung des Blutdruckes. Eine mässig schwere Albuminurie ist für gewöhnlich intermittierend, entweder vom Morgentypus oder einfach orthostatisch (während der tätigen Tagesstunden anwesend), und endlich als ein Zeichen ihres tuberkulösen Ursprunges eine wohl entwickelte—d'Arloing-Courmont—Serumreaction, die oft $\frac{1}{15}$ überschreitet. Diese Fälle, welche mehr als 34 Prozent unserer Statistik der intermittierenden Albuminurie bei jungen Individuen ausmachen, gehen nicht in wirkliche Tuberkulose über. Deshalb scheinen sie den Ausdruck *"paratuberkulöse Albuminurie"* zu rechtfertigen und viele dieser Fälle gehören zur Kategorie spontaner Immunisierung, auf welche Professor Courmont kürzlich die Aufmerksamkeit gelenkt hat.

Intermittent Albuminuria of Childhood Considered in its Relation to Hereditary Tuberculosis.—(TEISSIER.)

Hereditary tuberculosis may attack the kidney in the child or in the adult in one of two ways:

1. Certain individuals present a more or less abundant albuminuria, which is usually intermittent, and which may affect one of the well-known classical cycles; but it disappears as the pulmonary localization becomes established, or gives rise to general lesions, and may, therefore, be termed pretuberculous albuminuria.

This form of albuminuria does not necessarily imply the existence of renal tuberculosis, but, on the contrary, seems to have a toxic origin, and resembles the bacteriolysis which is an expression of the spontaneous defensive forces of the organism. As soon as this spontaneous destruction ceases, tuberculosis develops and the albuminuria disappears.

2. Finally, we have a second series of cases, which are much more numerous. The kidney is affected in a peculiar manner, which we have been able, by a long series of similar observations, to determine almost with certainty; the kidney reacts very slowly and sluggishly to the action of the tuberculous toxin transmitted by the parent, and a slight degree of latent nephritis is produced, which results in a very relative impermeability, relieving itself in a moderate diminution of the total molecular diuresis, an increase in the coefficient of Koranyi, and also in a slight elevation of the blood-pressure; a moderately severe albuminuria, usually intermittent; either of the matutinal (morning) type, or frankly orthostatic (present during the active hours of the day); and, finally,—as the hall-mark of its tuberculous origin,—a well defined Arloing-Courmont serum-reaction, often exceeding $\frac{1}{15}$th. These cases, which make up more than 34 per cent. of our statistics of intermittent albuminuria in young subjects, do not eventuate in actual tuberculosis. For this reason they seem to justify the term paratuberculous albuminuria, and many of these cases belong to the category of spontaneous immunization.

SECTION IV.

Tuberculosis in Children—Etiology, Prevention, and Treatment (*Continued*).

THIRD DAY. MORNING SESSION.

Wednesday, September 30, 1908.

THE CHILDREN OF TUBERCULOUS PARENTS. FAMILY ASSOCIATION. HUMAN CONTAGION IN INFANTILE TUBERCULOSIS.

The President, Dr. Jacobi, called the Section to order at ten o'clock.

CHILDREN OF THE TUBERCULOUS.

By Theodore B. Sachs, M.D.,
Chicago.

In presenting his theory of the gradually accumulating opportunities for infection with the advance of age, as an explanation of the varying frequency of tuberculosis at different periods of human life, Cornet finds substantiation in the clinical, mortality, and autopsy statistics.

The fact of the more frequent occurrence of fully developed tuberculous lesions in adult life, as compared with infancy and childhood, is admitted by the adherents of the hereditary theory of tuberculosis, which assumes a prenatal infection, followed by innocuousness of the infecting agent during the first year of life.

While the paucity of authenticated cases of congenital tuberculosis—in all about 20—makes the conception of hereditary transmission of the disease itself untenable, the idea of prolonged latency of the tubercle bacillus does not conform with the present knowledge of the germ, allowing it in its usual form but a limited cycle of existence under the most favorable conditions.

The significance of the factor of hereditary predisposition, in the sense of a "receptive soil," is accepted to a certain extent even by the most ardent contagionists, but the degree of its influence in the development of individ-

ual cases of tuberculosis is still undefined, neither by the accumulated clinical nor laboratory investigation.

With the assumption of the contagion theory of tuberculosis, ascribing the origin of every individual case to postnatal infection, at times of bovine, but generally of human source, numerous problems in connection with the evolution of the disease still remain unsolved, and of these, the connection between infection in infancy and childhood and the development of tuberculosis in later life is a problem of greatest importance in the proper conception of the disease and formulation of effective measures for its eradication.

The solution must necessarily lie either in the assumption, by the tubercular germ, of a certain form in which it may remain inactive for a prolonged period of time, or in a specific hyper-susceptibility imparted to the tissues by previous infection.

These and various other problems belong to the realm of laboratory and experimental research, out of which most of the light must come to explain the obscure phenomena of the most wide-spread disease of modern times.

The present investigation was undertaken with the object of determining the frequency of recognizable tuberculosis in children exposed to infection in surroundings most favorable to transmission of the disease. With this in view, 146 families, with one or both parents known to be tuberculous, were selected from the records of the Chicago Tuberculosis Institute, the Visiting Nurse Association, and my private practice.

Classification of the Parents.—The parents were classified as follows:

	Fathers.	Mothers.
Tuberculous	32	58
Dead from tuberculosis	43	22
Non-tuberculous	71	66

In 7 families both parents were tuberculous. Fifty-eight per cent. of all deaths from tuberculosis among parents occurred within one year preceding the investigation; 79 per cent. within two years. The families were of the average laboring class, living in the poorer districts of the city, and in most cases impoverished by the protracted illness of father or mother.

Ages of the Children.—Total number of children, 479: 19 under one year of age (15 examined); 62 between one and five years (48 examined); 105 between five and ten (91 examined); 108 between ten and fifteen (81 examined); 86 between fifteen and twenty (45 examined), and 99 above twenty (of the 42 examined, 39 were between twenty and thirty years of age).

Ninety per cent. of the examined children were breast-fed.

Mortality.—Up to the time of the investigation 131 deaths occurred in these 146 families. Eighty per cent. of the entire mortality was in children under five years of age (52 per cent. in the first year, 28 per cent. between one and five years). Only 10 per cent. of deaths in the first five years of life

were ascribed to tuberculosis; 25 per cent. to intestinal ailments, and 35 per cent. to pertussis, measles, and pneumonia, which diseases frequently conceal tuberculosis in the mortality statistics.

Eleven deaths were among children between five and fifteen years (3 due to tuberculosis); 15 deaths between fifteen and thirty years (11 due to tuberculosis).

Manifestations of Tuberculous Infection in Children at Various Ages.

The manifestations of tuberculous infection, at various ages, as revealed by symptoms and physical signs, were as follows:

1. General Condition. Habitus Phthisicus.—The parentage of 15 children under one year of age (youngest three months old) included 10 tuberculous mothers and 5 tuberculous fathers. Disease far advanced in 3 mothers and 5 fathers. Eleven children breast-fed. General development of all normal, with the exception of two, who had slight flattening of anterior aspect of the chest. Weight normal or above normal in 10; slight deficiency in 4; emaciation in one (tuberculous meningitis). Characteristic features of habitus phthisicus absent.

With the advance of age, from infancy to adult life, the stigmata of the phthisical type grow more pronounced and are observed in a larger proportion of cases, as shown in the following table:

	Under 1 Year.	1 to 5 Years.	5 to 10 Years.	10 to 15 Years.	15 to 20 Years.	Above 20 Years.
Habitus phthisicus	0	6 per cent.	7 per cent.	16 per cent.	16 per cent.	21 per cent.

Under this heading were grouped children presenting the combination of narrow chest (in anteroposterior or both diameters), long neck and extremities, winged scapulæ, etc.

Single deviations from the normal type of chest were observed with the following frequency:

	1 to 5 Years.	5 to 10 Years.	10 to 15 Years.	15 to 20 Years.	Above 20 Years.
Flattening of the anterior aspect of the chest and narrow anteroposterior diameter.....	10 per cent.	13 per cent.	15 per cent.	15 per cent.	13 per cent.
Narrow anteroposterior and transverse diameters	4 per cent.	4 per cent.	5 per cent.	5 per cent.	6 per cent.

The average ratio of both diameters, based on measurements of chests of 300 children, was as follows: First year of life, 8 (or 9) to 10; first five years, 81 (or 84) to 100; five to ten years, 77 to 100; ten to fifteen years, 72 (75) to 100; fifteen to twenty years, 74 to 100.

The state of nutrition, as shown by weight in its proportion to height (based on Quetelet's figures), was normal or above normal in 64 per cent. of the cases.

2. Physical Signs at Various Ages.—One hundred and seventy-one of the total number of 322 examined children showed positive signs of the disease. Total number of families, 146.

	Total Born.	Of These Died.	Living.	Examined.	Tuberculous.
Born before parent became tuberculous....	458	93 (20 per cent.)	365	230	126
Born after parent became tuberculous.....	155	41 (26 per cent.)	114	92	45
Total.....	613	134	479	322	171

An estimate of the incidence of tuberculosis among these children can be drawn from the consideration of 77 families in which the entire number, viz., 264 children, were examined: in 76 of them (29 per cent. of the total) positive evidence of tuberculous infection was found. An investigation of the same 77 families gives a total of 28 per cent. of tuberculosis for the children born before the parent became tuberculous, and 31 per cent. for those born after. The higher percentage of tuberculous cases among the second category of children cannot be solely ascribed to the lower resistance of children born of parents tuberculous at the time of their conception; consideration must be given to the closer contact between the child and source of infection in the more crowded and unhygienic surroundings into which the tuberculous sufferer gradually drifts with the progress of his disease.

The localization of the disease in 171 children pronounced tuberculous was as follows:

Under 1 year of age: Cervical glands operated, 1; meninges, 1; skin, 1.

1 to 5 years: Lungs, 3; cervical glands operated, 2; joints, 2; meninges, 1; skin, 1; localization not established, 7.

5 to 10 years: Lungs, 14; cervical glands, 4; joints, 4; localization not established, 16.

10 to 15 years: Lungs, 22; cervical glands, 5; joint, 1; spine, 1; localization not established, 14.

15 to 20 years: Lungs, 22; cervical glands, 3; kidney, 1; localization not established, 4.

Of the 99 children above 20 years of age, examination included those whose history suggested a previous or existing tuberculous infection. In all, 41 showed positive signs of the disease: tuberculosis of joint, 1; cervical glands operated, 5; pulmonary incipient, 13; pulmonary advanced, 11; pulmonary incipient arrested, 11.

To 106 cases diagnosed as tuberculous (chiefly those under fifteen years of age) the cutaneous tuberculin test was applied, with the following results: 83 positive reactions, 12 doubtful, and 11 negative.

In 31 per cent. of children under twenty years of age pronounced positively tuberculous the site of the lesion could not be established by physical examination. The diagnoses, made after prolonged observation, were based on consideration of the general condition, recurring afternoon fever, other corroborative symptoms and signs, differentiation from other diseases, and positive cutaneous tuberculin reaction.

These cases, obscure as to the location of the tuberculous focus, were more numerous in the first few years of life—amounting to 44 per cent. of all positive cases between one and five years; 42 per cent. between five and ten; 33 per cent. between ten and fifteen; 13 per cent. between fifteen and twenty; none after twenty years of age, where the involvement in nearly all was pulmonary.

With the full knowledge of the fact that, in a large proportion of obscure tuberculous cases in young children, the glands, particularly the bronchial, are the most probable site of the existing lesion, still this cannot be definitely established in individual cases by the present methods of physical examination. The study of the general condition, particularly the temperature, appeared to me of the greatest importance.

3. Range of Temperature.—A study of the temperature of children of tuberculous parentage frequently discloses certain constant abnormal variations, which, considered in conjunction with other corroborative evidence, may point strongly to the existence of tuberculous infection.

In these children, in the first decade of life, localization of the process is often impossible, and the constant afternoon fever, at times with a wide fluctuation between morning and evening temperatures, in some cases the periodical occurrence of "waves" of high fever of various duration, may be the only or the most prominent features. The fever frequently may be mild, requiring systematic observation for its detection and a knowledge of the normal range of temperature for its interpretation. In order to obtain a basis for comparison, diurnal measurements of temperature were taken in 250 apparently normal children from the same surroundings as the tuberculous families under discussion in this paper.

The result was as follows: In the ages between five and ten, the morning temperature (between 9 and 10), taken by mouth, varied between 99.4° and 100.4° F., the average being 99° F.; the afternoon temperature (4 to 6 p. m.), 97.4° to 100.5° F.; average, 99.3° F. For the ages between ten and fifteen the morning temperature varied between 98° and 100.2 ° F.; average, 98.2° F.; afternoon, 98° to 100.2° F.; average, 99.2° F.

In the children pronounced tuberculous in this investigation the morning

temperature taken by mouth, for the ages between five and ten years, varied between 97.6° and 99.6° F.; average, 98.3° F.; afternoon, 98.2° to 101° F.; average, 99.7° F.; between the ages of ten and fifteen, morning temperature, 97° to 99.6° F.; average, 98.4° F.; afternoon, 98.8° to 100.4° F.; average, 99.5° F.; between the ages of fifteen and twenty, morning temperature, 97.4° to 98.6° F.; average, 98.2° F.; afternoon, 99.2° to 100.2° F.; average, 99.6° F.

In a large number of cases the noon temperature was the highest of the day.

4. Von Pirquet Cutaneous Tuberculin Reaction.—The cutaneous tuberculin test of von Pirquet (25 per cent. solution) was employed in 217 children of the 322 examined.

		Positive.	Negative or Doubtful.
8	children under 1 year	2, or 25 per cent.	75 per cent.
58	" from 1 to 6 years	25, or 43 " "	57 " "
108	" " 7 " 14 "	53, or 49 " "	51 " "
28	" " 15 " 20 "	17, or 60 " "	40 " "
15	" above 20 "	11, or 73 " "	27 " "

These figures agree to some extent with the result of the same test employed in 460 positive or suspicious cases of tuberculosis by Dr. Petruschky, whose article appears in the May number of "Tuberculosis," the monthly publication of the International Tuberculosis Association.

Dr. Petruschky's results were as follows:

		Positive.	Negative or Doubtful.
12	sucklings in	0 per cent.	100 per cent.
22	children from 1 to 6 years in	50 " "	50 " "
148	" " 7 to 14 " "	75 " "	25 " "
69	" " 15 to 20 " "	86 " "	14 " "

The rare occurrence of positive cutaneous tuberculin reaction in the first year of life is as significant as the gradual increase with age in the number of positive reactions.

Conclusions.

In making this investigation cognizance was taken only of cases which presented positive evidences of the disease.

In families in which the entire number of children were examined (nearly all under twenty years of age) the percentage of the tuberculous was 29.

Cases presenting large cervical glands or suspicious signs of possible bronchial adenopathy (as shown by dullness and bronchophony over the spine below the seventh cervical vertebra) were not included in this number unless the diagnosis was made certain by other positive findings and the occurrence of tuberculin reaction.

The majority of children under fifteen years of age pronounced tuberculous did not manifest any impairment of general condition sufficient to in-

terfere with their school attendance. The constitutional disturbance in a large number of cases was very slight.

With the advance of age of the children definite localization of the tuberculous foci grows in frequency until, after twenty years of age, pulmonary involvement is found in the vast majority of positive cases.

In the crowded homes of the tuberculous poor, at least one-third of the small children show evidences of infection, and yet, if further development of the process takes place, and life is not terminated by some intercurrent affection, it generally takes years before the characteristic phenomena of adult phthisis become evident.

While the effect of infection in early life on the specific susceptibility of the growing child still remains to be determined by laboratory and experimental research, the familiar type of adult phthisis is probably the result of successive infections, as suggested by the increasing number of tuberculous lesions and tuberculin reactions with the advance of life and the gradual development of the stigmata of the phthisical type.

Los Niños de los Tuberculosos.—(SACHS.)

Examen de 322 niños de padres tuberculosos: la clase obrera; Ambiente favorable a la transmición de la tuberculosis.

Veinte por ciento de los niños menores de 5 años; 28 por ciento entre la edad de 5 a 10 años; 25 por ciento entre 10 y 15 años; 14 por ciento entre le edad de 15 a 20 años.

Alta mortalidad en los primeros años de vida de otras enfermedades; la mortalidad de la tuberculosis aumenta con la edad.

Veinte y neuve por ciento de los niños demuestran evidencias positivas de la enfermedad; la tuberculosis en veinte y nueve por ciento de los niños nacidos antes que la enfermedad fuese declarada en los padres; treinta y uno por ciento en aquellos nacidos después; La diferencia debida parcialmente al contacto íntimo con la infección á causa del aumento de la familia y la compendiada capacidad del trabajo de los padres.

El avance en la edad, desde la infancia hasta la edad adulta; desarrollo gradual del tipo tísico, Aumento frecuente á la reacción de la tuberculina. Studio sobre la variación de la temperatura en los niños aparentemente sanos y en los niños de padres tuberculosos bajo las mismas condiciones. La tisis en la edad adulta es, en muchos casos, el resultado final de la infección durante la infancia.

Les Enfants des Tuberculeux.—(SACHS.)

Examen de 322 enfants de parents tuberculeux; classe ouvrière; milieu favorable à la propagation des maladies.

20 pour cent. des enfants au-dessous de 5 ans; 28 pour cent. entre 5 et 10 ans; 25 pour cent. entre 10 et 15; 14 pour cent. entre 15 et 20.

Mortalité élevée, provenant de maladies autres que la tuberculose, pendant la première année; la mortalité due à la tuberculose augmente avec l'âge.

29 pour cent. de tous les enfants présentèrent des signes positifs de la maladie: 28 pour cent. des cas de tuberculose se trouvèrent chez des enfants nés avant que le père ou la mère ne fût devenu tuberculeux; 31 pour cent. chez des enfants après la tuberculisation des parents; la différence est attribuée en partie au contact plus intime avec l'infection dans les habitations surpeuplées où la famille est forcée de déménager quand le père ne peut plus travailler.

Au fur et à mesure que l'enfant grandit les stigmates du type phtisique se développent et les réactions à la tuberculine deviennent plus fréquentes. Etude de courbes de températures chez les enfants apparemment bien-portants et les enfants de parents tuberculeux, dans les mêmes conditions. La phtisie chez l'adulte est souvent le résultat final d'une infection qui a eh lieu dans l'enfance.

Die Kinder tuberkulöser Eltern.—(Sachs.)

Untersuchung von 322 Kindern tuberkulöser Eltern; arbeitende Klasse; Umgebung günstig für die Verbreitung der Krankheit.

Zwanzig Prozent der Kinder im Alter von unter 5 Jahren; 28 Prozent zwischen 5 und 10 Jahren; 25 Prozent zwischen 10 und 15; 14 Prozent zwischen 15 und 20.

Hohe Sterblichkeit an nicht-tuberkulöser Erkrankung im ersten Jahre des Lebens. Die Todesrate von Tuberkulose nimmt mit dem Alter zu.

Neunundzwanzig Prozent aller Kinder zeigten positive Evidenz der Erkrankung; 28 Prozent von Kindern, die geboren wurden bevor die Eltern tuberkulös geworden waren. Einunddreissig Prozent bei jenen, die später geboren wurden. Der Unterschied zum Teile der engeren Berührung mit Ansteckung in mehr überfüllten Umgebungen zugeschrieben, in welche die Familie hineingerät, mit einer Verkürzung der Arbeitsfähigkeit der Eltern.

Mit von der Kindheit zum erwachsenen Alter fortschreitender Entwicklung; ansteigende Entwicklung der Anzeichen des phthisischen Typus; wachsende Häufigkeit der Tuberkulinreaktion; Studien über den Verlauf der Temperatur bei anscheinend gesunden Kindern und den Kindern tuberkulöser Eltern in derselben Umgebung. Phthisis der Erwachsenen in vielen Fällen das Endresultat einer Infektion in der Kindheit.

THE OCCURRENCE OF PULMONARY TUBERCULOSIS IN THE CHILDREN OF TUBERCULOUS PARENTS.

By James Alexander Miller, M.D.,
Director of the Bellevue Hospital Tuberculosis Clinic,
and I. Ogden Woodruff, M.D.,
Assistant Physician in the Bellevue Hospital Tuberculosis Clinic, New York.

This report is based upon the careful examination of 150 children whose parents were under treatment for tuberculosis at the Bellevue Hospital Tuberculosis Clinic. The examinations were made as a part of the routine of the clinic in its endeavors to supervise the families and to discover unsuspected cases of tuberculosis, and the children observed lived, in most instances, under unsanitary conditions in tenements, in close association with their parents, the majority of whom had advanced tuberculosis. With few exceptions these children were not brought for treatment because of symptoms, but were simply sent for examination as a routine procedure by the visiting nurse. Their ages vary from two to fifteen years, with an average of eight and one-half years.

The difficulty of diagnosing such cases is easily appreciated, but as this sort of preventive work marks the line along which progress in our knowledge of tuberculosis must proceed, our endeavors to establish a diagnosis in these cases may be valuable. The most important factors in diagnosis may be summarized as follows:

First, malnutrition.

Second, pulmonary symptoms and physical signs.

Third, enlarged cervical lymph-nodes.

Fourth, hypertrophied tonsils and adenoids.

Fifth, the tuberculin tests.

Sixth, sputum examinations.

A diagnosis can be reached only by a consideration of all these factors. In making a diagnosis we have considered:

A. *As positively tuberculous:* (1) All cases with positive typical physical signs in the lungs. (2) All other cases with constitutional or pulmonary symptoms, malnutrition, or physical signs in the lungs which reacted to tuberculin.

B. *As doubtful:* (1) All children in whom tests were not made who showed constitutional or pulmonary symptoms or atypical signs in the lungs, or who showed malnutrition alone. (2) All apparently healthy children who reacted to tuberculin.

C. *As not tuberculous:* (1) All in whom tests were made who did not react. (2) All with no symptoms or signs and of normal weight in which no tests were made.

Of the 150 cases, 76, or 51 per cent., were positively tuberculous; 43, or 29 per cent., were not tuberculous; and in 31, or 20 per cent., the diagnosis was doubtful. Of the tuberculous cases, 54, or 71 per cent., presented definite pulmonary signs. Of the remaining 22, 14 gave the history of a cough, and 4 others gave evidence of a tuberculous focus elsewhere in the body.

Considering these diagnostic factors we may take:

1. Malnutrition.—One hundred and seven children were under the standard weight for their age. Of these a positive diagnosis was made in 60, or 56 per cent.; doubtful in 20; and 27, or 23 per cent., were considered non-tuberculous.

Out of 100 cases in which the height was measured, 73 were under the standard weight for their height. Of these, 31, or 42 per cent., were positively tuberculous, 19, or 26 per cent., were not tuberculous, and 23, or 32 per cent., were doubtful.

2. Pulmonary Symptoms and Signs.—Eighty-seven children, or 58 per cent., gave a history of protracted cough. Of these, a positive diagnosis was made in 65 per cent.; 73 cases had abnormal physical signs in their lungs, 72 per cent. of these being positively tuberculous. Only 15 children had the usual typical signs found in adults, and all these children were over nine years of age. The other 58 cases had physical signs which have not been generally accepted as typical of tuberculosis. Thirty-five had fine localized subcrepitant râles in some portion of the chest other than the apices of the upper lobes, usually without any change in percussion-note or breath-sounds. These râles, in most instances,—in 28 of the 35 cases,—were found in the region of the nipples, usually in the fifth or sixth intercostal spaces, just without the midclavicular line. In two-thirds of the cases they were on the left side; in a few cases on both sides. As a rule, these râles were constant, but in a few cases they were inconstant or were developed during a tuberculin reaction. Twenty-three cases showed sibilant or sonorous râles over the lungs. These were localized in various parts of the chest in 10 cases, in the others more or less generally distributed. Of the 58 cases with atypical signs, a positive diagnosis of pulmonary tuberculosis was made in 39, or 67 per cent., a doubtful diagnosis in 9, and a diagnosis of not tuberculous in 10, or 17 per cent.

A further analysis shows: Of the cases with fine râles, a positive diagnosis

was made in 26, or 74 per cent.; of those with fine râles near the nipples, in 82 per cent.; 92 per cent. of those in which tests were made reacted to tuberculin.

Of the cases with signs of bronchitis, 13, or 56 per cent., were positively tuberculous. Of the 10 cases with localized signs, a positive diagnosis was made in 80 per cent., as against 55 per cent. of those in which the sibilant and sonorous râles were generally distributed.

Considering the constitutional condition and pulmonary signs together, we found 39 cases in which abnormal physical signs and malnutrition were associated. Of these, 31, or 79 per cent., were positively tuberculous; 6, or 15 per cent., were not tuberculous, with 2 doubtful.

3. Enlarged Cervical Lymph-nodes.—Enlarged cervical glands were found in 79 cases. Of these cases, 47, or 60 per cent., were considered positively tuberculous, 10 doubtful, and 22 not tuberculous. They were found in three-fifths of all cases which reacted to tuberculin. A slightly larger proportion of cases reacted in which there was glandular enlargement in addition to pulmonary symptoms and signs, than of those cases in which there was no glandular enlargement.

Of cases which had symptoms but no physical signs, those which had also enlarged glands reacted in 66 per cent., while all such cases without enlarged glands reacted.

Enlarged glands were present in the same proportion in cases with physical signs, as in those without. Of the cases with typical pulmonary signs, enlarged glands were present in only 40 per cent.

4. Hypertrophied Tonsils and Adenoids.—These were present in 65 of our cases. Of this number, 31, or 47 per cent., were considered tuberculous, 11 doubtful, and 23 not tuberculous. Hypertrophied tonsils were present in only 43 per cent. of those which reacted to tuberculin. In those with pulmonary signs, in only 35 per cent. In cases which had typical pulmonary signs, in only 20 per cent. Of cases with cough, 7 per cent. more of these without enlarged tonsils reacted than of those with them.

5. The Tuberculin Tests.—One hundred and thirteen cases were tested with ophthalmic and cutaneous tests, and of these, 38 were also given tuberculin hypodermatically as control. Seventy-four, or 65 per cent., of these cases reacted. In 95 cases the eye and skin tests were made in the same individual. The results of these local tests were identical in all but 10. In 9 a skin reaction occurred with no eye reaction. Four of these were later injected with tuberculin and all reacted. In 1 case the eye reaction occurred with no skin reaction. This took place in an overgrown boy of fifteen years, and suggests a confirmation of the impression that the skin test is more reliable in children than in adults.

We have had no permanently injurious results from the ophthalmic

test, though some of the reactions were very severe and prolonged. Exacerbation of the local reaction, both in the eye and in the skin, during a reaction to the hypodermic test given from three to five weeks later, was noted in some cases, and in the skin particularly presents a very characteristic picture.

That a positive skin reaction is presumptive evidence of tuberculosis is supported by the following facts:

(1) Of 9 cases of positive typical physical signs of tuberculosis of the lungs, in which the test was made, all 9 reacted.

(2) Of 73 cases with suspicious symptoms, 80 per cent. reacted; of 40 without such symptoms, only 40 per cent. reacted.

(3) Of those with physical signs in the lungs, both typical and atypical, 82 per cent. reacted; of those with no physical signs, 48 per cent.

(4) Of those whose nutrition was below par and with cough and signs in the chest, 88 per cent. reacted; of those without pulmonary symptoms or signs, and of normal weight, only 25 per cent. reacted.

(5) Of the 38 cases controlled by tuberculin injections there was no discrepancy between the local and hypodermic test in any case. Nine of these were negative and 29 positive.

6. Sputum Examinations.—Very few of our children expectorated. Sputum examinations were made in only 16 cases. In only 1 case were tubercle bacilli found.

In a few cases the method advocated of exciting a cough and catching sputum on a swab was tried. In no instances did it give a positive result.

Conclusions.

Our conclusions are as follows:

1. The occurrence of pulmonary tuberculosis in children of tuberculous parents is much more prevalent than is usually supposed.

2. The type of pulmonary tuberculosis generally seen in adults is extremely rare in children under ten years of age.

3. Given history of infection, of the factors considered as determining a diagnosis, the occurrence of physical signs is the most important, and the presence of fine râles in the region of the nipple just without the midclavicular line is extremely suggestive of a tuberculous lesion.

4. In cases in which the symptoms are merely those of bronchitis, though the localization is suggestive, a positive diagnosis cannot be made from the clinical picture.

5. In children, the cutaneous tuberculin reaction is more reliable than the ophthalmic reaction, and fully as much so as the hypodermic test. In view of the untoward effects which sometimes follow the instillation of tuberculin into the eye, it is questionable whether this method as a routine process is justifiable.

6. In children between the ages of two and fifteen years the local cutaneous test affords a reliable means of detecting a tuberculous focus in the body, and, therefore, in the doubtful cases is a trustworthy method of differentiating the tuberculous from the non-tuberculous.

7. Every case reacting to the local tuberculin test does not require the same treatment as a case of tuberculosis, though it should be kept under careful observation. Given a tuberculin reaction in an apparently healthy child, the course to be pursued should depend entirely on the behavior of the case under close observation.

8. Malnutrition is sometimes the only appreciable evidence of tuberculosis in children.

9. The susceptibility to infection of a child seems to stand in no relation to the presence of hypertrophied tonsils or adenoid growths, nor does their presence in a suspected case appear in any way to incline the balance in favor of tuberculosis.

10. The evidence that enlargement of the cervical lymph-nodes is a determining factor in a diagnosis of tuberculosis is not conclusive. In any event, it does not seem to have an influence sufficiently consistent to make it of aid in the diagnosis of tuberculosis in a doubtful case.

11. The examination of the sputum is almost useless as an aid to the diagnosis of early tuberculosis in children.

Tuberculosis Pulmonar en los Niños de Padres Tuberculosos.—(MILLER Y WOODRUFF.)

Ciento cincuenta niños de padres tuberculosos fueron examinados los cuales forman la base de este artículo.

De los 150 casos, 76 ó 51 por cento se, encontraron afectados de tuberculosis, 43 ó 29 por cento se encontraron libres de tuberculosis y en 31 ó 20 por cento el resultado fue dudoso. Los factores principales sobre los cuales el diagnóstico fue hecho son los siguientes: 1. Mala nutrición. 2. Síntomas pulmonares y sus correspondiente signos físicos. 3. Agrandamiento de los nudos linfáticos cervicales. 4. Hipertrofia de las amígdalas y glandulas linfáticas. 5. La reacciòn de la tuberculina. 6. Examen del esputo.

De estos los sintomas pulmonares y signos fisícos y la reacción de la tuberculina, son los mas valuables y consistentes en la diagnóstico.

Los signos, fisicos en los niños, menores de diez anos, no son aquellos signos típicos que se encuentra en los adultos en lesiones tipicas del vertice del pulmon, sino que con mas frecuencia, estos signos son los de una bronquitis persistente localizada, por lo general, en la parte antero- inferior del pecho.

La reacción oftálmica, cutanea é hipodermica de la tuberculina fueron mpleados, y los resultados de las reacciones locales fueron corroboradose en todos los casos en los cuales la reacción hipodérmica fue tambien hecha. La reacción cutanea fue mas constante que la reacción oftálmica.

Agrandamiento de los nudos linfáticos cervicales é hipertrofia de las amígdales y otros tejidos linfaticos, no aparecen ser un factor determinante en el diagnostico de la tuberculosis. Mala nutricion, algunas veces, es la sola evidencia apreciable de la tuberculosis en los niños. El examen del sputo fue de poco valor.

Los resultados de estas investigaciones dan base al a conclución que la tuberculosis pulmonar en los niños de padres tuberculosos es un hecho.

Das Vorkommen der Lungen-Tuberkulose bei Kindern tuberkulöser Eltern.—(Miller und Woodruff.)

Ein hundert und fünfzig Kinder tuberkulöser Eltern waren als Grundlage zu diesem Berichte untersucht worden.

Von den 150 Fällen waren 76, oder 51 Prozent, als positiv tuberkulös befunden worden; 43, oder 29 Prozent, nicht tuberkulös; und 31, oder 20 Prozent, zweifelhaft. Die Hauptmomente, die bei der Diagnose auftreten, sind: 1. Schlechte Ernährung. 2. Lungen-Symptome und physikalische Zeichen. 3. Vergrösserte cervikale Lymphknoten. 4. Hypertrophierte Tonsillen und Adenoïde. 5. Tuberkulin-Versuche. 6. Sputum-Untersuchung.

Von diesen scheinen die Symptome und Zeichen in den Lungen und die Tuberkulin-Versuche am wertvollsten und feststehendsten zu sein. Die physikalischen Zeichen bei Kindern unter zehn Jahren sind nicht die der typischen Spitzen-Verletzung, wie sie für gewöhnlich bei Erwachsenen gefunden werden, sind aber oft Anzeichen einer bleibenden lokalisierten Bronchitis, gewöhnlich im vorderen unteren Teile des Brustkorbes. Die ophthalmischen, kutanen und subkutanen Tuberkulin-Versuche wurden alle angewendet, und die Resultate der lokalen Versuche dienten als Bestärkung in allen Fällen, in denen auch der subkutane Versuch Beweise ergeben hatte. Der kutane Versuch war völlig, wenn nicht mehr beweiskräftig als der ophthalmische Versuch.

Vergrösserte cervikale Lymphknoten, hypertrophierte Tonsillen, und Adenoïde scheinen kein entscheidender Moment in einer Diagnose von Tuberkulose zu sein. Schlechte Ernährung ist manchmal die einzige schätzenswerte Erklärung der Tuberkulose bei Kindern. Die Untersuchung des Sputums hatte wenig Wert.

Die Resultate dieser Forschung führen zu der Schlussfolgerung, dass Lungentuberkulose bei Kindern tuberkulöser Eltern sehr häufig ist.

A CLINICAL STUDY OF THE TRANSMISSION AND PROGRESS OF TUBERCULOSIS IN CHILDREN THROUGH FAMILY ASSOCIATION.

By Cleaveland Floyd, M.D., and Henry I. Bowditch, M.D.,
Boston, Mass.

The solution of any great problem, vitally affecting the welfare of the State and nation, should be applicable, first, to the home, that unit of national foundation. Where the home is menaced, the State is always endangered. Tuberculosis invariably has been a disease of the household, a fact the more important when considered together with the rapid growth of municipal communities. Not only is it a distinct danger to the family, but, from the very nature of its chronicity it is an enormous economic loss to the community.

In endeavoring to control tuberculosis, proper consideration should be given to the child. Too frequently the children of to-day are the consumptives of to-morrow, being handicapped by heredity and exposed through family associations. The solution of the problem, therefore, must embrace the sick, and the endangered as well. The work in Boston has included not only the phthisical patient, but also his family. Records of the public charities and hospitals have been searched in quest of cases of tuberculosis. Where disease has appeared within the past four years, the household has been visited and investigated, and again and again the need of medical supervision has been most apparent. In this way the incipient case has been discovered, predisposition controlled, and the well maintained in health.

Influences Favoring Infection in the Child.—The effect of tuberculosis on the mortality of early years shows its influence to be greatest during infancy. This death-rate, as repeated observations show, appears to decrease slowly as the child grows older. Susceptibility is at its height in this early period, and where a predisposition through heredity is added to a soil not unfavorable for the growth of the disease, the likelihood of infection is vastly increased. Children are peculiarly susceptible to unhygienic surroundings. Overcrowding, lack of fresh air and sunlight, dirt, neglect, and improper food, the natural environment of the majority, all tend to increase the normal low resistance of the child at this period. The influence of measles, whooping-cough, and influenza is known to exert a powerful predisposing effect toward tuberculosis. The activity of the lymphoid tissues of the body

in early life and the onset of puberty are physiological phenomena of considerable importance.

It must not be forgotten, however, that the habits and characteristics of the child in daily life have an important part to play. The close intimacy of child with child, its parents and neighbors, in school and at home, materially aids in spreading the disease.

The presence of tuberculosis in the household plays a very important part in the life of the child. Even when cleanliness of person and the habits of the consumptive are ideal, there is still a minimum amount of danger of infection. When carelessness and ignorance abound, contagion is not only probable, but very frequent.

Modes of Infection.—Where we deal with a constant exposure to disease, the modes of infection must necessarily be various and frequently multiple. The two prominent paths of infection, ingestion and inhalation, have contributed greatly without doubt, but in any individual case it was impossible to determine which manner of infection occurred.

In our study of 1000 children it appears that whatever the mode of entrance might have been, probably direct transmission of the disease from parent to child was the most important factor. Of these cases, 679 have been in immediate contact with tuberculosis in the home, and of this number 36 per cent. showed definite signs of pulmonary consolidation. This type of infection has been strikingly demonstrated in a large number of instances. Following one open case of tuberculosis in a parent, evidence of the disease was found in all but one of five children. This has been true not only of one but of many families.

The respiratory tract is not the only vulnerable point in the youthful organism. The lymphoid tissues of the throat, by means of adenoids and tonsils, present a very favorable point of entrance for the tubercle bacillus. They aid directly in the transmission of the disease, and, by obstructing the upper air-passages and producing improper breathing, favor the production of pulmonary tuberculosis

The systematic laryngoscopical examination of our cases shows about 50 per cent. (493 children) to have hypertrophied tonsils, whereas operable adenoid growths appeared in only about 145. Tonsillotomy and adneoidectomy, even when imperative, were necessarily rarely performed, on account of popular prejudice. Of the few operated on, no tubercles were demonstrable pathologically in the tissues removed.

In only 11 instances did infection point to the glands of the neck, and of this number only 5 showed pulmonary involvement. In regard to the localization of infection in bone or joint, except for 4 cases of tuberculosis of the hip and 1 of the finger, this type of infection has not been encountered.

Invasion of the serous cavities, the peritoneum, and the meninges was

discovered in only two or three instances. This is of interest when we note, from the report of a small phthisis hospital, that 11 children out of 24 born of tuberculous mothers died of tuberculous meningitis.

Incidence.—The early detection of intrathoracic tuberculosis in the infant or child is frequently accomplished only with extreme difficulty. Very often the actual condition in the lungs is only suspected, and a positive diagnosis is not made until lesions are extensive or general miliary disease supervenes. The explanation of this state of affairs lies in the peculiar anatomical condition in the chest of the child, where the pathological process must be of relatively large extent to be evident. The chronic sore throat and persistent laryngitis, with its cough, so frequently occurring in the children of the poor, distract attention from the lungs. The existence of pulmonary disease is frequently overlooked because of the presence of measles or pertussis. The non-appearance of sputum is a serious handicap. With children under constant supervision, this difficulty may be obviated, as shown by Holt, but the dispensary clinic cannot so readily profit by the swab method. We have been able to collect sputum in only 62 of these cases, and in only 3 of these were bacilli present.

It is difficult to obtain an accurate estimate of the extent of pulmonary tuberculosis in early life, and wide diversity of opinion exists in regard to it. Morse states that pulmonary lesions are comparatively rare before puberty, but are of more common occurrence in childhood than in infancy. Squire says of phthisis in the United Kingdom that it is the most common and fatal of all diseases of infancy and childhood. The Registrar-General's report for 1905 for England and Wales showed a total of 16,650 cases. On the other hand, systemic examination of school-children in London has shown that among 1670, only 8, or 0.47 per cent., showed signs of phthisis, and when those with doubtful signs were taken into account, it made a total of 1.3 per cent. Mackensie found 18 cases in 600 school-children in Edinburgh, and Robertson, 6 cases among 806 in Leith. Leubuscher found 2 cases in 1400 school-children in Germany, whereas Grancher, in Paris, found that about 15 per cent. of 14,226 children gave evidence of glandular or pulmonary tuberculosis. This author also finds that about 25 per cent. of children of tuberculous parents are similarly affected or predisposed to the disease. These results were obtained in an examination of the average school-child, the majority being apparently well and not exposed to the disease.

Among 679 children taken from the poorest homes of Boston, in which 470 contained living consumptives, and in 179 more of which there had been recent deaths from the disease, there were definite signs of pulmonary involvement in 36 per cent. More than 66 per cent. of the entire number showed symptoms of the disease. Of 321 children, living amid poverty and

neglect, who were brought for examination on account of suspicious symptoms, about 30 per cent. were looked upon as tuberculous, although not directly exposed in the home.

In regard to post-mortem statistics, J. Comby has published reports from the hospitals of Paris, showing that 38.5 per cent. of children examined showed tuberculous lesions. Müller, in Munich, found 43 per cent. out of 500 examinations. Hamburger and Sluka discovered 41 per cent. in 401 post-mortems in children under fifteen years of age. These figures apply to tuberculosis occurring in any portion of the body in children dying from various causes. Hamburger's tables showed that pulmonary infection was present in 50 per cent. of the cases, and that the bronchial glands were involved in 98 per cent. In examining all necropsy reports, however, it should be remembered that many tuberculous foci may have occurred secondary to the terminal disease, and that many more are never discovered during life. These reports are taken from general hospitals. If autopsies could be obtained on a series of children such as we have had under observation, very few would probably be found free from tuberculosis. It is interesting to note that the percentage of cases showing tuberculosis at necropsy tallies closely with our records of cases with pulmonary tuberculosis.

Other Factors Influencing Infection.—As to the part played by milk in the production of tuberculosis, in children especially, McCaw calls attention to the fact that of 26,193 cases under treatment for various disorders in Belfast, 20 per cent. under five years showed tuberculosis, and of these, 40 per cent. were of the surgical type (bone and glandular). In other English cities, as London and Manchester, also in Glasgow and Edinburgh, the predominance of surgical tuberculosis treated in hospital clinics has been marked. McCaw further states that the general consensus of opinion is that surgical tuberculosis is generally of the bovine type, and that bovine and human infection do not commonly occur in the same case. With us, where infection was probably due to the human type in the great majority of instances, every opportunity of infection being at hand, only 11 cases of glandular tuberculosis and 5 of bone infection occurred. It must be remembered that these were not selected cases, only in so far as every exposed child possible was examined. Why, then, has it happened that the surgical types have been so infrequent? This question cannot be answered unless we take the position that surgical tuberculosis is produced by the bovine bacillus, and in our cases the human type of infection has been reproduced by direct transmission.

Concerning the period of latency of phthisis in children, it would seem, from a number of observations, that, following direct exposure, only a few months intervened before active symptoms appeared. In others, however, the intervals have been considerably longer. The great difference of sus-

ceptibility to tuberculosis in different children has been very noticeable. Even when placed amid similar surroundings and exposed for the same period of time they vary much in this respect.

The size of the cardiac area, in its relation to the development of phthisis, is often important. In the measurement of 800 hearts in children, our results were remarkably uniform both as to age and development. In a very few the cardiac area was distinctly undersized. Even in the poorly developed and nourished the heart did not seem to have suffered in development. Valvular lesions were infrequent, only 10 cases of mitral regurgitation and 2 of mitral stenosis being present.

Type of Disease—Infant or Adult.—In any large children's hospital two types of tuberculosis are common—the general disseminated and the chronic phthisis of the adult. The latter group, chronic phthisis, includes practically all our cases, only two cases of general miliary tuberculosis having been detected and one proved at autopsy. What bearing this has on individual susceptibility we do not know. In these cases infection has, perhaps, been conveyed in small repeated doses, and the stimulation of the body resistance thereby has prevented diffuse lesions. Be this as it may, the great preponderance of the adult type of lesion is certainly noteworthy.

Symptoms and Signs.—Many a child with few or no symptoms will, in the study of a phthisical family, show, on examination, genuine evidence of tuberculosis in some portion of the body. The acute respiratory symptoms that often follow measles, or are associated with the common cold, will frequently be overlooked, and later a semiquiescent pulmonary lesion be discovered. With the repetition of colds and sore throat, from neglect or diseased nasopharyngeal conditions, the pulmonary process may be lighted up or increase in extent and make itself apparent. Languor, pallor, and loss of strength and appetite are the first symptoms noted. Night-sweats are frequent, and loss of weight is rapid. Cough is generally constant and distressing. Hemoptysis is uncommon. Slight evening pyrexia is most significant. Cough, however, is so common in the child that too much dependence must not be placed upon this symptom. Young examined 337 children under fifteen years of age in trying to estimate other etiological factors for cough besides pulmonary tuberculosis. Of this number, only 45 showed pulmonary lesions. In our cases 262 showed involvement of one or both apices of the lungs. In about 100 the lesions were equally divided between the middle and lower lobes. The extent of the lesion varied greatly, and apparently had little connection with the length of exposure to infection. Very few lesions had advanced to cavity formation, and where the disease was extensive, the process generally took the type of acute bronchopneumonia with septic manifestations.

Diagnosis by Various Means and their Value.—The younger the child,

the more difficult it is to diagnose the lesion, especially in its incipient stage. A careful consideration of the family history and the clinical symptoms is imperative, in order to arrive at a correct conclusion. In the differential diagnosis of chronic pulmonary phthisis the group of symptoms in children may be closely simulated by a number of conditions. Phthisis and asthma may frequently be associated, and we should not be misled by the more evident process. The diffuse catarrhal lesions in the lungs, the expiratory distress, and the characteristic sputum, if it can be obtained, may aid us in the detection of the asthma. The symptoms following acute nasal and throat infections are often confusing, and unless the upper air-passages are studied, the diagnosis may long remain uncertain. The cough in tonsillar hypertrophy with nasopharyngitis and the expectoration of mucus, general debility, and loss of strength often make it impossible to exclude a beginning pulmonary lesion. When tuberculosis of the bronchial glands is present, with night-sweats, cough, and dyspnea, in addition, perhaps, to local signs at the upper portion of one of the lungs, time is required to settle the question as to whether or not the lesion is pulmonary. The recurrent attacks of bronchitis are often followed by phthisis, and may later conceal it. Even after we have learned all that clinical methods can tell us, many conditions will be obscure, and laboratory methods will be demanded.

Repeated examination of the sputum, when it can be obtained, will often aid the diagnosis, and occasionally tubercle bacilli will be found when the pulmonary examination is negative. Where the laryngologist is at hand, this may be collected from the larynx on a swab. In older children, with training and the aid of an expectorant sputum can be obtained in a considerable number of cases. The use of the stomach-tube for the purpose of obtaining specimens of swallowed mucus will probably be a method mostly confined to hospital practice. The employment of tuberculin is of real value and may stamp many a doubtful case as tuberculosis. The injection of tuberculin subcutaneously is the most accurate diagnostic means we have, and its prompt and definite reaction, general and local, will not only decide whether or not the case is tuberculosis, but will often indicate where the process is located. The cutaneous and ophthalmic reactions have been found of great value, especially because of their simplicity. With the cutaneous reaction there are rarely any constitutional symptoms and no dangers are connected with its use. It is generally reliable in its results, but in how large a percentage of cases of tuberculosis a positive reaction occurs is still undetermined. Engel and Bauer, having used the cutaneous reaction on about 300 cases, conclude that it is of great diagnostic value. We have found the ophthalmic reaction of value in a number of cases in confirming our suspicions as to the presence of tuberculosis. Because of the increasing number of reports of injury done to the tested eye, and since, in our own experience,

we have had three cases of phlyctenular conjunctivitis, we have relied on the other methods of administration. In a number of cases we used both methods, and found that they frequently gave identical results, and then, again, one was positive and the other negative. In fourteen instances in which the cutaneous reaction was negative the ophthalmic reaction was positive. Of 73 children giving a negative examination, 30 gave a positive tuberculin reaction. Of 174 children suspected of tuberculosis, 112 gave a positive reaction. These newer methods of giving tuberculin as an aid to diagnosis have been found of value in confirming our suspicions in doubtful cases and in leading us to consider slight signs and symptoms of more importance.

The use of the *x*-ray in conjunction with these other measures has been found of great value, an expert having been employed to interpret our radiographs. It has been learned that the most careful examination will fail to detect the true extent of a tuberculous process, and that one that appears well localized may be very diffuse. All means and agencies at our disposal have been used in attempts to reach a decision. Even then time and repeated observations have been necessary.

Treatment.

In our community, while the educational movement is rapidly making progress in regard to tuberculosis among all classes of people, our duty to children has not been fully realized. No adequate provision has yet been made to place these children in suitable environment, so that they may regain their health. The problem of removing the infected member of the family is being well worked out, but until we can care for all the ignorant and careless consumptives, our problem in regard to children will still remain unsolved. Much, however, can be done through isolation, education, and cleanliness. We have had a considerable number of children under observation in day camps and in the country, and the results have exceeded our expectations. Not only has the general improvement been rapid, but a number of active lesions have become quiescent after a few weeks' treatment. It would seem that the child, at its receptive age, can be easily taught the methods of hygienic living, and the recuperative powers of the body at this stage make the opportunity and the results of treatment very promising.

Prophylaxis.

In order better to protect our children the following measures are important: (1) Early notification of all births. (2) Better inspection and control of the cities' milk-supply. (3) Systematic school inspection. (4) Housing reform. (5) Segregation of advanced cases. (6) Compulsory notification of the disease. (7) Provision for the care of pulmonary tuberculosis in children. (8) Education of all school-children on matters of general

hygiene. Nearly all these measures are being enforced in Massachusetts, and as the forces of sanitation and education advance, the problem of preventing tuberculosis is nearer solution.

STATISTICS.

Number of children, 1000. Boys, 475; girls, 525.
Under one year, 35. Between one and five years, 249. Between five and fifteen years, 716.
Total number exposed to tuberculosis in the home, 679.
Total not exposed to tuberculosis in the home, 321.
Total exposed in the home showing pulmonary lesions, 254.
Family History: Living phthisical patients in family, 500. Died of phthisis (within four years), 179. Negative history of phthisis, 320.

Group A (Children under One Year).

Diagnosis.		Physical Examination.	
Negative	27	Negative	28
Pretuberculous	1	Catarrhal	7
Bronchitis	5	Consolidation	0
Miliary tuberculosis	2		

Exposed, 25. Total, 35.

Group B (Children from One to Five Years of Age).

Diagnosis.		Children from One to Five Years of Age. Examination.	
Negative	152	Negative	174
Pretubercular	12	Signs of consolidation	39
Tubercular	10	Catarrhal signs	36
Bronchitis	27		
Phthisis (?)	39		
Phthisis	9		

Exposed, 171. Total, 249.

Group C (Children from Five to Fifteen Years of Age).

Diagnosis.		Children from Five to Fifteen Years of Age. Examination.	
Negative	526	Negative	424
Pretubercular	50	Signs of consolidation	222
Tubercular	49	Catarrhal	70
Bronchitis	43		
Phthisis (?)	210		
Phthisis	38		

Exposed, 481. Total, 716.

Throat examinations: Tonsils hypertrophied, 493; adenoids, 145.
Heart lesions: Mitral stenosis, 2; mitral regurgitation, 10.
Lung: Apical lesion, 262; middle and lower lobe involvement, 100.

Tuberculin.

Children negative on examination, 73; positive to tuberculin, 30.
Children suspected of tuberculosis, 178; positive to tuberculin, 112.
Positive reactions, 142; negative, 97. Total, 239.

Explanation of Nomenclature.

Pretubercular, patients having tubercular symptoms with negative reaction examination.
Tubercular, patients having tubercular symptoms with tuberculin reaction.
Phthisis (?) patients having tubercular symptoms and signs of pulmonary consolidation.
Phthisis patients having signs and symptoms of phthisis with positive sputum or tuberculin reaction.

BIBLIOGRAPHY.

M. Adolphe D'Espine: "Early Diagnosis of Incipient Thoracic Tuberculosis," Bull. de l'Academie de Méd., Jan. 29, 1907, vols. lvii, lviii, p. 167.
M. J. Comby: "Etiologie de la Tuberculose Infantile," La Presse Méd., December 22, 1906, vol. xiv, p. 833.
A. Calmette: "Etiologie de la Tuberculose Infantile," La Presse Méd., 1906, p. 765.
C. W. Bridge: "Tuberculosis in Children," Chicago Med. Recorder, vol. xxiii, p. 436.
C. R. Kerser: "Treatment of the Common Tubercular Affections in Children," Brit. Jour. Children's Dis., July, 1907, vol. iv, p. 278.
L. E. LaFétra: "Tubercular Cervical Lymph-Nodes in Infants," Arch. Pediat., vol. xxiv, p. 418.
Jos. Stark: "Surgical Tuberculosis and the Opsonic Index," Brit. Med. Jour., 1907, vol. i, p. 1336.
Wallace: "Etiological Factors in Bone Tuberculosis in Children," Med. Rec., New York, vol. lxx, p. 908.
John Lovett Morse: "Tuberculosis of the Kidney in the Infant," Med. Jour., vol. lxxiv, p. 1081.
H. H. Felton: "A Case of Intestinal Obstruction in a Child due to Tubercular Peritonitis following Bronchopneumonia," Med. Rec., October, vol. lxx, p. 614.
Johnson: "Forms of Surgical Tuberculosis in Children," Clinical Jour., London, vol. xxviii, p. 385.
Squire: "Pulmonary Tuberculosis in Children," Brit. Med. Jour., 1906, vol. ii, p. 133.
R. A. Young: "Pulmonary Tuberculosis in Infancy and Childhood," Brit. Med. Jour., 1908, vol. i.
M. Grancher: "La tuberculose ganglio-pulmonaire dans l'école parisienne," Le Bulletin Méd., November, 1906, vol. lxxxvii.
McCaw: "Tuberculosis in Childhood and Milk," Brit. Med. Jour., December 21, 1907.
Kelynack: "Care of Tubercular Children," Brit. Med. Jour., September 21, 1907.
Lancet: "Revealed Tuberculosis in Children from Four to Fifteen Years," London, December, 28, 1907.
"Three Years' Work at Sea Breeze Hospital," Med. Rec., New York, March 7, 1908.
Reviere: "Tuberculin Treatment of Tuberculosis in Children," Brit. Med. Jour., October 26, 1907.
Morse: "Treatment of Tuberculosis in Infants and Children," New York Med. Jour., February 28, 1908.
Scott: "Reliability of Calmette's Ophthalmo-tuberculin Reaction," Med. and Surg. Jour., April, 1908.
Butler: "Calmette's Ocular Reaction," Brit. Med. Jour., April 18, 1908.
"Ocular Reaction to Tuberculin," Berl. klin. Woch., xlv, No. 4, January 27, 1908.
"Ocular and Cutaneous Reaction to Tuberculin," Berl. klin. Woch., No. 5, February 3, 1908.
"Conjunctival and Cutaneous Application of Tuberculin," Deutsche med. Woch., xxxiv, No. 7, February 13, 1908.
"Clinical and Historical Study of v. Pirquet's Cutaneous Reaction to Tuberculin in Children," Presse Méd., September 26, 1907, No. 78.
"Cutaneous and Ocular Reaction to Tuberculin," Jour. Am. Med. Assoc., October 26, 1907.
"Experiments with von Pirquet's Cutaneous Reaction to Tuberculin," Berl. klin. Woch., xliv, No. 37, September 16, 1907.
Satterlee: "Serious Results of Ocular Tuberculin Test," Jour. Am. Med. Assoc., June 27, 1908.

Transmición y el Progreso de la Tuberculosis en los Niños por Medio de la Associatión con la Familia.—(FLOYD Y BOWDITCH.)

El artículo consiste del estudio de unos novecientos casos de tuberculosis en los niños observados por algunos meses en el Hospital de Tísicos de Boston. La edad de los pacientes fluctua entre pocos meses y quince años.

La mayor parte de ellos han estado expuestos a la infección, por un tiempo variable, debido a la presencia de tuberculosis en el seno de la familia. Por medio de repetidos examenes físicas, del esputo, la aplicación de los rayos X y la reacción de la tuberculina, los resultados demuestran que cerca de 40 por ciento presentan lesiones definitivas de tuberculosis pulmonar, 26 por cient. presentan signos y sintomas de tuberculosis. Examen de la garganta se hizo en casi todos los casos y en cerca de 50 por ceinto se encontraron condiciones prejudiciales a la respiración normal. En un gran numero de los casos se encuentran los sintomas clínicos bien marcados, mas en otros estos fueron absentes. Los autores con de la opinión que la presencia de un numero tal de casos de tuberculosis pulmonar, debido al contacto directo y prolongado con las personas tuberculosas en el hogar, demuestra claramente que el hogar debe ser el gran campo de la profilaxis en la eliminación de la tuberculosis. No solamente el paciente, sino tambien la familia deben estar bajo una observación directa del médico.

La transmission et le progrès de la tuberculose chez les enfants par les rapports dans la famille.—(Floyd et Bowditch.)

Ce travail consiste dans une étude d'environ 900 enfants gardés en observation pendant plusieurs mois à l'Hôpital des Poitrinaires de Boston. Les cas variaient entre quelques mois et quinze ans d'âge, et la majorité avait été exposée à la phtisie pendant une époque variée par suite de la présence de cas ouverts dans la maison. Au moyen d'examen physique et d'examen du sputum répétés, au moyen de la tuberculine et des rayons X, on trouva que 40 pour cent environ avait des lésions pulmonaires définies et 26 pour cent environ avaient des signes ou des symptômes évidents de tuberculose. Des examens de la gorge, faits dans presque tous les cas, montrèrent dans 50 pour cent des conditions préjudiciables à la respiration normale. Dans un grand nombre des cas les symptômes cliniques aidèrent à faire le diagnostic, mais un bon nombre n'avaient absolument aucun mal. Les auteurs pensent que la présence d'un si grand nombre de cas montrant des lésions pulmonaires définies, quand l'exposition a été directe et prolongée, ne fait qu'accentuer le fait que la maison est le champ d'action le plus vaste pour les mesures prophylactiques pour contrôler cette maladie. Non seulement le malade mais les proches parents devraient être soumis à un strict examen médical pendant cette période d'exposition.

RÔLE DE LA CONTAGION HUMAINE DANS LA TUBERCULOSE INFANTILE.

Par le Dr. J. Comby,
Paris.

Laënnec, qui devait mourir prématurément phtisique, nous a laissé une admirable description anatomique et clinique de la tuberculose. De son temps, la contagion de la maladie n'était soupçonnée; mais sa fréquence dans certaines familles avait fait croire à l'influence prépondérante de l'hérédité, de l'atavisme.

L'application du microscope à l'étude des lésions anatomiques ne donna pas tout d'abord les fruits qu'on pouvait espérer; c'est ainsi que Virchow et l'école allemande s'égarèrent dans la doctrine de la dualité de la phtisie que bientôt devait combattre victorieusement Grancher suivi de toute l'école française (1873).

Mais déjà Villemin (1865), en démontrant expérimentalement l'inoculabilité de la matière tuberculeuse, avait ouvert la voie aux découvertes modernes. Koch, qui dévoila plus tard le microbe de la tuberculose (1882), fit éclater la valeur des recherches géniales de Villemin.

Villemin et Koch ont porté le dernier coup à la doctrine de l'hérédité tuberculeuse. De la contagiosité de la maladie, prouvée expérimentalement et cliniquement par d'innombrables travaux, doivent s'inspirer toutes les mesures de défense individuelle ou collective contre la tuberculose. Sans nier la contagiosité de la phtisie, qui est l'évidence même, certains médecins croient encore à la transmission héréditaire, soit du germe, soit du terrain propice au développement de la tuberculose: *hérédité de graine, hérédité de prédisposition*, tels sont les deux termes qui résument actuellement la doctrine de l'hérédité.

On a vu, chez les animaux comme dans l'espèce humaine, la tuberculose se transmettre de la mère au fœtus par la voie placentaire; cela arrive parfois quand la femme enceinte est parvenue à un degré de phtisie très avancé. De cette transmission tuberculeuse *in utero*, on connaît quelques observations authentiques, dont MM. Péhu et Chalier ont fait le compte dans un article récent*.

* Péhu et Chalier: "De la tuberculose humaine congénitale," Arch. de méd. des enfants, janvier, 1908.

Il résulte de la statistique très complète établie par eux, que l'hérédité de graine est exceptionnelle et qu'on peut négliger son rôle dans l'étiologie de la tuberculose de l'enfance.

Quant à l'hérédité de terrain, autrement dit la prédisposition héréditaire, elle est admise par un grand nombre de médecins. On croit généralement que les enfants des tuberculeux naissent avec une prédisposition à contracter la tuberculose. Cette erreur est enracinée dans beaucoup d'esprits. Elle est d'ailleurs basée sur des faits bien observés mais mal interprétés.

On voit, en effet, les enfants issus de familles tuberculeuses être atteints dans une proportion infiniment supérieure à ceux qui proviennent de familles indemnes.

Mais devons-nous expliquer par l'hérédité la morbidité et la mortalité excessives qui déciment ces familles de tuberculeux?

Il n'est plus possible de soutenir la transmission directe du bacille de Koch par la voie placentaire, *l'hérédité de graine;* on se contente de la transmission organique favorable à la culture du bacille. On a même prétendu reconnaître cette prédisposition au facies et à l'habitus extérieur des enfants: pâleur, maigreur, étroitesse de la poitrine, adénopathies souscutanées, etc. Ces stigmates peuvent s'observer dans les familles tuberculeuses, et la prédisposition héréditaire semble ainsi s'affirmer en traits assez saillants. Mais l'habitus extérieur dont nous venons d'esquisser quelques traits n'est pas spécial aux enfants de souche tuberculeuse; il se voit chez d'autres enfants, issus de parents sains, et qui ont été exposés de bonne heure à une contamination étrangère (nourrices, gardeuses, etc.).

La pâleur, la maigreur, l'étroitesse thoracique, la micropolyadénopathie, sont des symptômes, non pas de prédisposition, mais de tuberculose avérée.

Les enfants ainsi conformés ne sont pas des prédisposés à la tuberculose, des prétuberculeux, mais bien des tuberculeux latents. En d'autres termes, ils n'ont pas hérité de leurs parents phtisiques la prédisposition à contracter la tuberculose; mais ils ont été contaminés par eux de bonne heure, et c'est pourquoi ils présentent ce facies particulier qui dénote une tuberculose cachée. Ce n'est ni une tuberculose héréditaire, ni une prédisposition héréditaire, mais bien une tuberculose acquise par contagion familiale.

Grâce aux procédés modernes d'investigation clinique, la cuti-réaction à la tuberculine de Von Pirquet, l'oculo-réaction de Wolff-Eissner et de Calmette, nous pouvons dépister les tuberculoses les plus secrètes et montrer ainsi que ces enfants dits prédisposés sont en réalité de vrais tuberculeux, et il est facile désormais de renverser l'édifice si artificiel et si fragile de la prédisposition héréditaire.

En règle générale, à quelques exceptions près, la tuberculose des parents ne se transmet héréditairement aux enfants sous aucune forme, et l'hérédité de terrain n'existe pas plus que l'hérédité de graine. Si vous éloignez, le

jour même de sa naissance, l'enfant qui vient de naître d'une mère phtisique au dernier degré, pour l'élever hors de la contagion familiale, dans un milieu indemne, il grandira sain et robuste, sans devenir tuberculeux; donc il n'a hérité ni de la graine ni du terrain. S'il reste dans son milieu familial infecté, la contagion est fatale, et tôt ou tard on en constatera les effets.

Dans ces cas de tuberculose familiale, acquise par contagion, l'oculo-réaction ou la cuti-réaction vont nous permettre de faire une sélection utile pour le traitement et pour la prophylaxie. J'ai vu, dans la même famille, des enfants réagir positivement à la tuberculine, alors que leurs frères et sœurs ne présentaient aucune réaction.

Tantôt les enfants indemnes avaient vécu loin de leurs parents, pendant que ceux-ci toussaient et crachaient près des frères et sœurs restés à la maison. Tantôt les enfants indemnes étaient nés après la guérison d'une tuberculose paternelle ou maternelle, qui n'avait été funeste qu'aux premiers nés.

Exemple: Une femme d'une trentaine d'années a eu de la bronchite chronique avec hémoptysie, il y a quelques années: elle a un garçon de quatre ans qui réagit positivement à la tuberculine et un bébé de six mois qui ne réagit pas. C'est que, depuis deux ans, ne toussant plus, elle a cessé d'être dangereuse pour son entourage.

J'ai cité, dans un mémoire précédent (Congrès de la tuberculose, 1905), des cas nombreux de contagion familiale: enfants devenus tuberculeux aprés un contact plus ou moins prolongé avec les phtisiques de leur voisinage: père, mère, grands-parents, oncles et tantes, nourrices et bonnes, familiers de la maison, etc. De tous ces faits, bien connus aujourd'hui et dont les médecins ont pu vérifier l'exactitude, j'avais déjà tiré les conclusions au Congrès français de médecine réuni à Montpellier, en 1898. Ces conclusions, je les ai développées dans des publications ultérieures et je demande la permission de les résumer.*

Dans l'immense majorité des cas, la tuberculose infantile dérive de la contagion familiale. La tuberculose des enfants ne se voit que dans les familles tuberculeuses. Vit-il dans un milieu indemne, l'enfant ne se tuberculise pas, quel que soit son mode d'alimentation. La tuberculose des enfants ne vient pas du lait qu'ils consomment, mais des bacilles humains qu'ils inhalent ou ingèrent dans les milieux contaminés par les phtisiques.

Tout cela peut paraître trop absolu entaché d'erreur aux yeux de beaucoup de médecins, et je vais résumer les arguments qui plaident en faveur de cette doctrine.

* Dr. J. Comby: "Tuberculose pulmonaire chez l'enfant," Arch. de méd. des enfants, mai, 1898; "Tuberculose chez un nourrisson de cinquante-six jours," ibid., sept., 1900; "Tuberculose chez un enfant de quarante jours," ibid., février, 1904; "Contagion familiale de la tuberculose chez l'enfant," ibid., nov., 1905; "Gouttes de lait et tuberculose infantile," ibid., mars, 1908; "Oculo-réaction à la tuberculine," Soc. méd. des hôpitaux, 1907; "Cuti-réaction," ibid., 1908.

Contre la transmission par le lait des vaches tuberculeuses, on peut dire tout d'abord qu'il n'y a pas identité entre le *bacille bovin* et le *bacille humain*. Mais, en admettant qu'il y ait identité de nature et d'origine entre ces deux bacilles, on sera surpris que la tuberculose infantile n'ait pas diminué malgré les mesures sévères prises depuis plus de vingt ans contre les vaches tuberculeuses et contre leur lait.

On a fait beaucoup de bruit autour de la tuberculose des bovidés, on a partout souligné le danger de consommer leur viande et leur lait. Il en résulte que:

1. On a éliminé le plus possible les vaches tuberculeuses des étables de la ville ou de la campagne; grâce à la tuberculine de Koch, la sélection est devenue facile, et elle est employée couramment dans les fermes importantes et les vacheries bien tenues et surveillées;

2. On a pris l'habitude de faire bouillir ou de stériliser le lait destiné aux nourrissons, et quelle que soit sa provenance; le chauffage du lait tue tous les microbes qu'il pourrait contenir; le lait cru n'étant prescrit qu'exceptionnellement, il devient bien difficile aux enfants de se contaminer par le lait.

Supposons que cette double pratique de la sélection des vaches et de la stérilisation de leur lait ne soit pas générale; que les vaches tuberculeuses continuent à fournir du lait à la consommation infantile, que les parents négligent de stériliser le lait destiné à leurs enfants. En résultera-t-il un danger sérieux, un risque redoutable de propagation tuberculeuse? Pour qu'un lait soit vraiment dangereux, il doit être souillé de nombreux bacilles de Koch, ce qui se voit surtout dans les cas de mammite tuberculeuse. S'il n'en contient qu'un petit nombre, il passera impunément par la voie digestive sans infecter l'enfant.

On a dit cependant le contraire, et des savants de premier ordre ont ainsi jeté le trouble dans les esprits. Le professeur Von Behring soutient que la tuberculose se transmet toujours par le lait de vache et que la porte d'entrée exclusive du bacille de Koch est le tube digestif. Sans être aussi exclusifs, les savants expérimentateurs français, Vallée (d'Alfort), Calmette (de Lille), ont accordé à la voie intestinale un rôle très important et fait à la contagion par le lait une place trop grande.

Sans parler des expériences contradictoires de Flügge, de Kuss et Lobstein, etc., la clinique infantile donne un démenti aux conclusions de Behring, Vallée et Calmette.

Comme je l'ai dit en 1898, comme je l'ai répété depuis lors maintes et maintes fois, comme l'ont vu les médecins d'enfants de tous les pays (Medin entre autres), la tuberculose des enfants dérive uniquement de la contagion humaine, de la tuberculose ouverte de leurs farmiliers ou de leurs proches (parents, domestiques, amis de la maison). Les faits d'observation à l'ap-

pui de cette *doctrine clinique* sont innombrables; ils se vérifient chaque jour dans la pratique médicale.

La tuberculose des enfants ne se voit que dans les familles tuberculeuses; là où vivent des adultes tuberculeux, on trouvera des enfants tuberculeux; là où il n'y en a pas, on n'en trouvera pas. Tous les enfants des milieux populaires où nous avons recueilli la plupart de nos observations boivent le même lait, reçoivent la même alimentation; les seuls qui deviennent tuberculeux sont ceux qui se trouvent exposés à la contagion humaine.

Donc le lait ne compte pas, le phtisique seul est à redouter. Je vais avoir recours maintenant à un argument d'ordre anatomique.

Les autopsies que j'ai faites dans les hôpitaux d'enfants, depuis quatorze ans, montrent l'accroissement de la tuberculose avec l'âge. Rare dans les premiers mois de la vie, la tuberculose augmente rapidement de fréquence dans les premières années et la seconde enfance. Les lésions les plus constantes et les plus anciennes semblent groupées autour de la trachée et des bronches, et l'adénopathie trachéo-bronchique semble être comme le pivot de toutes les localisations tuberculeuses infantiles; cette localisation initiale témoigne en faveur de la porte d'entrée aérienne. Je n'ai jamais observé de tuberculose primitive de l'intestin.

Sur un total de 1432 autopsies, j'ai relevé la tuberculose 529 fois (soit près de 37 pour cent); dans tous ces cas, j'ai trouvé des ganglions infiltrés, caséeux ou crétacés autour des bronches; les lésions des poumons, des méninges, du foie, de la rate, de l'intestin, des ganglions mésentériques, se sont montrées beaucoup moins fréquentes que la tuberculose des ganglions trachéo-bronchiques.

La proportion des tuberculeux varie beaucoup suivant l'âge des enfants. Sur 216 autopsies d'enfants de moins de trois mois, je n'ai relevé que 4 tuberculeux (moins de 2 pour cent); ces 4 cas s'expliquaient par la contagion maternelle, non par l'alimentation.

Sur 1008 autopsies d'enfants n'ayant pas dépassé deux ans, on compte 252 tuberculeux, soit près de 25 pour cent. Si l'on ne prend que les enfants entre un et deux ans, au nombre de 324, on trouve 140 tuberculeux (43 pour cent). Entre zéro et un an, sur 684 enfants, nous en trouvons 112 tuberculeux (un peu plus de 16 pour cent). Entre trois et six mois, sur 216 autopsies, 39 tuberculeux (18 pour cent); entre six et douze mois, sur 254 autopsies, 69 tuberculeux (27 pour cent). Après la seconde année, la proportion des tuberculeux atteint 67 pour cent.

De cette augmentation rapidement ascendante de la tuberculose à mesure qu'on s'éloigne de la première enfance, de l'âge où le lait forme la nourriture exclusive ou principale, on pourrait déjà conclure que le lait n'est pas le véhicule habituel de la maladie. L'enfant a beau consommer du lait en abondance, il ne devient que rarement tuberculeux; après le sevrage, quand

sa ration de lait est réduite au minimum, ses chances de tuberculisation augmentent. Qu'est-ce à dire?

Tout petit, couché dans un berceau ou porté sur les bras, le nourrisson vit dans un isolement relatif et ne participe que dans une faible mesure à la vie commune si féconde en contagions de toute sorte. Il est ainsi protégé contre la tuberculose des foules et des collectivités banales. Mais, si la tuberculose pulmonaire est dans sa famille; s'il est visité, embrassé, caressé, entouré par des parents tuberculeux qui toussent et crachent autour de lui, alors il est condamné à l'infection tuberculeuse, il ne saurait y échapper. Il y échappe d'autant moins qu'il est plus avancé en âge, les chances de contamination se multipliant avec les années.

Si le lait était la cause principale de la tuberculose infantile, c'est pendant l'allaitement, dans la première année, qu'on devrait rencontrer le plus de tuberculeux; c'est alors qu'on en trouve le moins.

Après une pratique de la médecine infantile qui dépasse vingt-cinq ans (onze ans au dispensaire d'enfants de la Société philantropique, quatorze ans dans les hôpitaux d'enfants de Paris), je déclare n'avoir pas vu un seul cas de tuberculose infantile causé par le lait, tandis que j'ai par centaines relevé les cas de contagion humaine. Toutes les modalités de cette contagion ont été exposées dans mon mémoire du Congrès de Paris; je n'y reviendrai pas.

L'histoire de la tuberculose infantile s'explique merveilleusement bien par la contagion humaine, surtout par la contagion familiale, dont les preuves anatomo-cliniques surabondent. Elle devient obscure, sinon incompréhensible, avec l'origine bovine et la transmission par le lait des animaux tuberculeux. La prophylaxie inspirée par cette dernière doctrine, et qui s'est traduite par la surveillance des viandes de boucherie, par la sélection des vaches laitières, par la stérilisation du lait, n'a absolument rien donné. Loin de reculer devant ces mesures d'hygiène, d'ailleurs parfaitement recommandables, la tuberculose infantile, comme le montre ma statistique hospitalière, est au moins aussi fréquente que par le passé.

C'est que ni la viande ni le lait ne sont coupables. Sans doute, il faut faire bouillir son lait, sans doute il est prudent de repousser la viande qui provient d'animaux tuberculeux, ou tout au moins de la stériliser par la chaleur. Mais, quand on aura fait cela, c'est comme si l'on n'avait rien fait. Toutes les précautions prises contre les vaches ou contre leur lait sont absolument vaines, si l'on n'a pas pu protéger l'enfant contre la contagion humaine, la seule qui compte en pratique. S'il continue à vivre avec un phtisique qui tousse et crache, l'enfant est fatalement atteint de tuberculose. Voilà ce qu'on doit bien savoir, ce qu'on ne saurait trop répéter.

Défions-nous des adultes et surtout des vieillards qui toussent et crachent, des grands-parents qu'on déclare atteints depuis longtemps d'asthme,

de catarrhe, d'emphysème, de bronchite chronique; ce sont autant de tuberculeux, parfois de bonne apparence, sans fièvre, sans cachexie. J'ai vu de nombreux enfants mourir de méningite tuberculeuse pour ne pas avoir été soustraits en temps opportun aux caresses de leurs grands-parents. Défions-nous des vieux diabétiques qui maigrissent et se mettent à tousser. Surveillons les parents, les amis, les familiers de la maison, les nourrices, les bonnes, les domestiques, les maîtres d'école, en un mot tous ceux que leurs liens de parenté, leurs relations, leurs fonctions retiennent auprès des enfants.

Pensons toujours et avant tout à la tuberculose, au danger formidable qu'elle fait courir aux jeunes sujets. Cette préoccupation constante des médecins et des familles préparera le terrain à la prophylaxie antituberculeuse.

En semant la terreur d'un mal si souvent inexorable, on fera adopter par les familles des mesures qui froissent parfois des sentiments respectables, mais qui doivent être prises néanmoins dans l'intérêt supérieur des enfants.

Il faut qu'on le sache bien une fois pour toutes: la tuberculose n'est pas héréditaire, les enfants ne naissent pas tuberculeux, ils le deviennent. Nous pouvons les préserver de la contagion, donc nous le devons. L'hérédité n'existe à aucun degré ni sous aucune forme; les enfants de tuberculeux n'apportent, en naissant, ni le germe ni la prédisposition.

Défendons-les contre la contagion de leurs proches, et nous les sauverons. La tuberculose ne se transmet jamais aux enfants par le lait des vaches tuberculeuses qu'ils sont exposés à boire; elle dérive toujours de la contagion humaine, particulièrement de la contagion familiale.

Donc la prophylaxie ne fera œuvre vraiment utile que si elle empêche les contacts entre les adultes tuberculeux et les enfants sains. Si ces contacts ont pu déjà s'exercer dans l'ignorance où l'on était de la nature du mal, il est urgent d'y mettre un terme. Et la prophylaxie doit se borner alors à prévenir les échéances funestes d'une tuberculose latente contractée au foyer familial. De ce foyer toujours infecté, il faut éloigner les enfants; c'est ce qu'avait admirablement compris Grancher quand il créa son Œuvre de préservation de l'enfance contre la tuberculose.

Cette œuvre, en pleine prospérité aujourd'hui, assure aux enfants pauvres des familles tuberculeuses un séjour prolongé à la campagne, chez des paysans indemnes, surveillés par des médecins affiliés à l'œuvre. Le retour à la terre, la vie rurale, le travail des champs, voilà ce qui sauvera la *graine* des générations futures.

Pour instituer ce traitement préventif des tuberculoses contractées à la ville et que la campagne guérira, il convient de faire appel aux nouveaux procédés de dépistage de la tuberculose, l'oculo-réaction de Wolff-Eisner et Calmette, la cuti-réaction de Von Pirquet.

Ces moyens, inoffensifs et d'une application facile, sont appelés à rendre

de grands services dans la médecine des enfants. Ils m'ont permis de faire à coup sûr, dans les familles, la sélection des enfants, et par suite de bien diriger les efforts de la prophylaxie antituberculeuse.

Menschliche Ansteckung als ein Factor in Kindertuberkulose.—(Comby.)

Die Übertragung von Koch's Bazillus von der Mutter auf das Kind durch die Placenta ist ausnahmsweise, noch ist der Boden irgendwie mehr ererbt als der Same. Es ist kein Zweifel, dass tuberkulöse Eltern Tuberkulose auf ihre Kinder übertragen, aber wenn sie es thun, dann ist es durch Berührung. Die Berührung in der Familie erklärt fast alle Fälle von Kindertuberkulose. Übertragung durch die Milch und das Fleisch tuberkulöser Kühe spielt eine sehr wenig wahrnehmbare Rolle in der Übertragung der Krankheit auf die species humana. Das Kind kann gegen diese Gefahr durch eine richtige Auswahl der Kühe und durch Sterilisation der Milch vollständig geschützt werden.

Unsere klinischen Forschungen haben gezeigt, dass tuberkulöse Kinder nur in Familien mit tuberkulösen Mitgliedern gefunden werden, gleichgültig, welche Art von Milch consumirt wird. Andererseits finden wir bei Autopsieen Tuberkulose der peribronchialen Drüsen, welche daher den Luftweg des Eintrittes des Koch'schen Bazillus darstellen.

Unter 1432 Autopsieen von Kindern von den Pariser Hospitälern im Laufe von vierzehn Jahren fand ich 529 tuberkulöse Fälle, oder ungefähr 37%; unter 216 Kindern von 0 zu 3 Monaten 4 tuberkulöse, oder weniger als 2%; unter 1008 von 0 zu 2 Jahren 252 tuberkulöse, oder ungefähr 25%.

Nach dem zweiten Jahre erreicht das Verhältnis tuberkulöser Cadaver 45, 50, 60 und 65%. All dies ist vollständig durch menschliche Ansteckung erklärt.

Die Prophylaxis sollte sich mit phthisischen menschlichen Wesen und nicht mit Kühen beschäftigen.

Human Contagion as a Factor in Infantile Tuberculosis.—(Comby.)

Transmission of Koch's bacillus from the mother to the fetus by way of the placenta is exceptional, nor is the soil inherited any more than the seed. There is no doubt that tuberculous parents transmit tuberculosis to their children; but when they do, it is through contagion. Family contagion explains almost all cases of infantile tuberculosis. Transmission through the milk or flesh of tuberculous cows plays a very insignificant part in the transmission of the disease to the human species. The infant

can be fully protected against this danger by a proper selection of cows and sterilization of the milk.

Our clinical investigations have shown that tuberculous children are found only in families in which there are tuberculous members, regardless of the kind of milk consumed. On the other hand, we constantly find at autopsies tuberculosis of the peribronchial glands, which therefore represent the aërial port of entry of the bacillus of Koch. Among 1432 autopsies on children from the hospitals of Paris during the course of fourteen years, I found 529 tuberculous subjects, or about 37%; among 216 infants from 0 to 3 months, 4 tuberculous, or less than 2%; of 1008 from 0 to 2 years, 252 tuberculous, or about 25%.

After the second year, the proportion of tuberculous cadavers attains 45, 50, 60, and 65%. All this is fully explained by human contagion.

Prophylaxis should occupy itself with phthisical human beings and not with cows.

El Contagio humano como factor en la Tuberculosis Infantil.—(COMBY.)

La trasmisión del bacilo de Koch de la madre al feto por medio de la placenta es excepcional. No hay duda que la tuberculosis de los padres puede ser trasmitida á sus hijos, mas en este caso la infección es por medio del contagio. El contagio de la familla explica, en casi todos los casos, la tuberculosis infantil. La trasmisión por medio de la leche ó carnes de animales tuberculosos puede ser posible, mas esta es de poca significación en la trasmisión de la enfermedad á la especie humana. Los niños pueden ser enteramente protegidos contra este peligro por medio de la selección de las vacas y la esterilización de la leche.

Nuestras observacions han demostrado que niños tuberculosos se encuentran solamente en las familias en donde un miembro de élla padece de la enfermedad, y que la calidad de leche usada por la familia no tiene gran importancia. Por otra parte constantemente se encuentra en las autopsias tuberculosis de las glandulas peribronquiales, las cuales presentan la puerta aerea para la entrada del bacilo de Koch. De 1432 autopsias hechas en el hospital de Paris durante el período de 14 años, yo encontré 521 personas tuberculosas ó sea 37% de los casos; De 216 niños de 0 a 3 meses de edad, cuatro tuberculosos, ó sea menos de 2%; entre 1008 de 0 a 2 años de edad, 252 tuberculosos ó sea un 25%.

Después de dos años de edad, la proporción de los cadáveres tuberculosos fue de 45, 50, 60 y 65%. Todo esto se explico perfectamente por medio del contagio humano.

Las medidas profiláticas, por lo tanto, deben ser dirigidas hacia el homber y no hacia los animales, particularmente la vaca.

DISCUSSION.

Dr. Woods Hutchinson (New York): The findings of the valuable papers that have just been read strike me with dismay. Tuberculosis is evidently much more frequent in children than is usually supposed. We have been overlooking the cases that recovered, just as we did in adults ten years ago. Yet this gives a definite point at which to strike the known consumptive and the rooms in which he lives, just as in malaria we struck at the pool in which the anopheles breeds. Cover this ground, and we can then hope to lower the present 70 per cent. of tuberculosis. The second striking point is the marked frequency of pulmonary lesions—more than 5 per cent. of the glandular, and less than 1 per cent. of bone and joint lesions.

It would look as if these latter forms were secondary to a pulmonary invasion. Certainly the large preponderance of bone and glandular tuberculosis in children in the older statistics was due to their easy recognition, while the pulmonary forms escape.

Dr. Rist (Paris, France): There is a new scheme of prophylaxis that was brought out by Professor Grancher, of Paris. From the fact that children always are infected by tuberculous parents or other tuberculous members of the family he came to the conclusions to take the still healthy children to a place where they can be protected from tuberculous infections; 200 children were taken away from their families and reared in the country or on farms.

The first condition is a very careful selection of the children, and only an entirely healthy child should be taken from the family. There is a special medical committee appointed for this purpose. The children are sent to country places, thus increasing the number of children who will escape from tuberculous infections. This work was not begun on a large scale, the cost being very low in France—almost one franc a day a child. In a wealthy country like the United States it should be very easy to follow out this scheme on a greater scale.

Dr. H. S. Goodall (New York) believes that an attack on tuberculosis in children is important, because we may stamp out this disease while the child is still young, and because the child will teach others how to live after he has himself been taught; that the physical signs are not like those in adults, but are atypical, as have been described; that a point on the anterior axillary line at the third space or fourth rib is a frequent seat of abnormal signs; that the area of lung tissue involved and the degree of temperature found, being equal to that in cases of adults, the immediate results are better in the children under ten years of age, and the permanent results, as far as may be judged after five years' observation, are certainly as good, if not better, than in adults. The records of Stony Wold Sanatorium bear out this statement.

Dr. Herbert Decarle Woodcock (Leeds, England) stated that he would like to remind the members that natural immunity is obtained only by contact with disease, not by isolation from disease.

The Anti-tuberculous Society of Trinidad has recognized this in a brightly written report in which it is stated that the "African fresh from his forest bed of leaves dies if brought into close contact with the disease," when the white man of old civilization does not succumb. The Irishman, living away from cities, dies when introduced to city life. The Jew, the ancient race which has been forced by tyranny to live in slums for more than one thousand years, is now much more immune to the disease than is the case with other races; yet if the Jew is introduced to conditions worse than he has been accustomed to, he succumbs.

In Leeds, England, there are 30,000 Jews; they have the worst dwellings in the city—the parts of the city refused by the English artisan. They confine themselves to the clothing trade, a trade dusty, unhealthy, carried out often under unsanitary conditions, causing phthisis among all races engaged in it.

The immunity of the Jew to phthisis has broken down to some extent in Leeds. Yet with all this the Jew is superior in health record and in physique to the Gentile in the same state of life, *i. e.*, in Leeds. This superiority of physique is especially noticeable in the young.

He examined a school a few weeks ago, and finds one-half with the Calmette reaction. All these children have defects in nose and throat. In an English artisan club he finds a large number of defects in nose and throat and teeth among the members. He examines the same number of Jewish club members (80 in each club) and does not find the defects in nose, throat, and teeth. Only the general results show that the more immune race had the normal nose and throat; the Jewish palate (hard) is dome-shaped, for instance.

In conclusion he said that if you isolate people from unsanitary surroundings, you must supply an artificial immunity to take the place of the natural immunity obtained by the elimination of the unfit. In all the splendid philanthropy of our country we must remember this, otherwise by complete isolation of peoples we shall retrograde in immunity.

Dr. Bovaird (New York) calls attention to the fact, as borne out by the paper of La Fétra on the opening day, that there are no typical or characteristic physical signs of tuberculosis in children. Physical signs taken alone should not be accepted as evidence of tuberculosis.

The use of tuberculin as a test, in the conjunctiva, in the skin, or subcutaneously, is evidently of great value in diagnosis, and is unquestionably enabling us to classify as definitely tuberculous many children who, under previous conditions, have passed as sound.

It is a question whether tuberculosis of children leads on directly to that of adult life. In pathological work it is well known that tuberculosis of children shows its most advanced lesion in the cervical, bronchial, or mesenteric glands in 80 per cent. of cases. In adult tuberculosis this is not at all true; in fact, a similar localization of the lesion is quite rare. It is, therefore, a debatable question whether one is directly concerned in the evolution of the other, and to what degree. Finally, this matter was not one of diagnosis, but of management. Many of these patients have only a latent tuberculosis, and require no treatment at the time. All such cases do, however, call for careful supervision and active measures in case of development of any symptoms suggestive of advance in the disease.

Dr. Hamill (Philadelphia) said that in work of this character we must be careful to interpret the physical signs correctly. He recently examined 300 children in an institution and could find but 12 cases in which he could definitely make the diagnosis of pulmonary tuberculosis. Two signs on which emphasis is laid are very misleading, *i. e.*, areas of diminished resonance and of diminished breathing. Such signs can be developed by mere change of position, *i. e.*, from side to side of the child, the resulting pressure so changing the signs. The diagnosis of tuberculosis from such signs should be questioned.

In his use of the conjunctival and subcutaneous tests with tuberculin he finds a very remarkable uniformity of results. This being true, he thinks it important to eliminate the conjunctival test, by reason of the danger attendant upon its use.

Dr. Jacobi (New York) said that, no doubt, pulmonary tuberculosis as seen in adult life is not very frequent in children. We hear of prophylaxis, but not a single word on treatment. We practitioners do not deal with tuberculosis by the one thousand or million patients, but we treat the individual. What can be done in the way of individual treatment? That is the responsibility of the practitioner to the patient. We are told that we cannot treat tuberculosis. We are told to use fresh air, good food, good clothing, etc. That is the line of treatment, just as much as the use of bismuth is recommended in enteritis or baths in typhoid fever. A night's restlessness may undo weeks of good air, good food, good clothing. A dose of morphin relieves and prevents that result and is good treatment. Digitalis, spartein, etc., may be used to help the circulation, and will do the patient good. Digitalis, two, three, or four grains a day, may be given for prolonged periods with benefit. We may give abundance of food without result unless we give a little bismuth and pepsin to help the feeble digestion. The usual way for sanatoriums to treat tuberculous patients without medicine is, as a matter of fact, defective.

SECTION IV.

Tuberculosis in Children—Etiology, Prevention, and Treatment (*Continued*).

THIRD DAY. AFTERNOON SESSION.

Wednesday, September 30, 1908.

ABNORMALITIES OF THE NASOPHARYNX. TUBERCULOSIS AND CONFINED AIR. PLACENTAL TRANSMISSION. SCHOOL HYGIENE IN ECUADOR.

The President, Dr. Jacobi, called the Section to order at three o'clock.

OBSTRUCTIVE ABNORMALITIES OF THE NOSE AND THROAT:

PREDISPOSING FACTORS TO TUBERCULOSIS IN SCHOOL CHILDREN.

By Dr. John J. Cronin,
New York.

The high percentage of abnormalities of the nose, throat, and pharyngeal spaces, found among children of school age from homes of the tuberculous, indicates that, whatever may be the reason of the abnormal development of lymphoid tissue and deformities, their presence induces a lessened resistance against the constant exposure to tuberculosis. Whether or not there is some one underlying factor that results invariably in tuberculosis cannot be stated. It is certain that these factors which operate against dull growth and development, if combined with exposure to the disease, result in some form of tubercular manifestation. The conditions of exposure being equal,

the chances of acquiring the disease are greater in those whose head cavities are abnormal; as evidence, children of the same family and practically the same exposure show much difference in the conjunctival tuberculin reaction; those with abnormalities show reaction, while those free show no reaction.

The intimacy of the exposure counts a great deal. From an analysis of the report submitted, the occurrence of the conjunctival reaction is more frequent among those under good housing conditions, but with abnormal head spaces, than among those with poor housing and free head spaces. It seems to me, therefore, that hygiene of the body, particularly the head cavities, is a more important prophylaxis. The conditions of housing cannot always be controlled; the hygiene of the head cavities can always be controlled.

Control of housing, feeding, and airing will not avail to the greatest extent unless the possibility of food and air contamination, when taken into the body, is removed; in other words, poorer food and air, in a body with clear head cavities, are less baneful than good food and air in a body with obstructed secreting tissues. Obstruction of the head cavities results in superficial breathing, and this results in a subnormal standard of development and sub-energized condition of the bodies.

The following forms of history cards are drafted for the purpose of studying the co-relation of predisposing factors. The study is practically limited to the American type of child. The total number reported on is 119.

SUMMARY.

Age Last Birthday, Years.	Number Reported on.			
	33	37	43	113
One	..	2	1	3
Two	1	1	1	3
Three	..	2	2	4
Four	1	1	4	6
Five	2	6	3	11
Six	4	2	4	10
Seven	4	2	4	10
Eight	3	3	3	9
Nine	2	1	2	5
Ten	4	1	3	8
Eleven	2	2	7	11
Twelve	4	1	1	6
Thirteen	2	4	2	8
Fourteen	..	4	2	6
Fifteen	1	1	..	2
Sixteen	1	1	3	5
Seventeen	1	..	..	1
Eighteen	..	..	..	0
Nineteen	1	2	1	4
Twenty	..	1	..	1

Number of Living-rooms.	Number Reported on.			
	32	9	16	57
One	..	..	1	1
Two	6	..	..	6
Three	17	5	5	27
Four	5	2	8	15
Five	4	2	2	8
Six	..	..	..	0
Seven	..	..	..	0

Number of Children Living.	Number Reported on.			
	32	13	15	60
One	4	..	1	5
Two	3	3	3	9
Three	10	..	6	16
Four	4	5	..	9
Five	6	5	..	11
Six	5	..	5	10
Seven	..	..	..	0

Number of Children Dead.	Number Reported on.			
	32	13	15	60
One	3	1	5	9
Two	8	4	..	12
Three	2	..	1	3
Four	..	..	2	2
Five	2	..	..	2
Six	..	..	1	1
Seven	5	..	..	5
Eight	12	8	6	26

Number of Adults in Family.	Number Families Reported on.			
	17	8	5	30
One	3	1	..	4
Two	13	7	3	23
Three	..	..	2	2
Four	1	..	..	1

Quality of Food.	Number Reported on.			
	33	12	14	59
Good	15	5	7	27
Bad	18	7	7	32

Service and Cooking.	Number Reported on.			
	33	12	14	59
Good	21	7	7	35
Bad	12	5	7	24

Member of Family Sick.	Number Families Reported on.			
	16	21	20	57
Father and mother	3	..	..	3
Father	10	15	14	38
Mother	2	6	3	11
Aunt	1	..	..	1
Uncle	..	..	1	1
Grandfather	..	..	1	1
Grandmother	..	..	..	..
Brother	..	..	1	1
Sister	..	..	1	1
Uncle and aunt	1	(Adopted child)	(Two in one family)	1

Physical Condition of Patient.	Number Reported on.			
	19	8	9	36
Dead	1	3	1	5
In bed	3	3	3	9
At work	15	2	5	22

Expectoration.	Number Reported on.			
	15	6	6	27
Profuse	10	4	3	17
Scant	5	2	3	10

Height.	Number Reported on.			
Above standard (American)				
Normal				
Below standard				

Weight (American).	Number Reported on.			
Above standard				
Normal				
Below standard				

Nutrition.	Number Reported on.			
	33	12	11	56
Good	22	7	7	36
Bad	11	5	4	20

Glands.	Number Reported on.			
	33	26	24	83
Enlarged anterior cervical glands	28	20	18	66

Posture.	Number Reported on.			
	33	26	25	84
Good	20	16	19	55
Bad	13	10	6	29

Conformation of Chest.	Number Reported on.			
	33	26	24	83
Good	24	17	18	59
Bad	9	9	6	24

Conformation of Ribs.	Number Reported on.			
	33	26	24	83
Good	25	18	18	61
Bad	8	8	6	22

Position of Scapulæ.	Number Reported on.			
	33	26	25	84
Good	22	17	19	58
Bad	11	9	6	26

Teeth (Decayed, Premature Loss, Deformed Arches).	Number Reported on.			
	32	9	13	54
Good	29	4	10	43
Bad	3	5	3	11

SUMMARY SHEET SHOWING

Name.	Birth.		Rooms.		Children.		Adults.	Food.		Member of Family Sick.	Time of Exposure.	Physical Condition.		Expectoration.	
	Date.	Number.	Number.	Sanitary Condition.	Living.	Dead.		Kind.	Service and Cooking.			In Bed.	At Work.	Profuse.	Scant.
Vohlidka, Emma	1901	1	3	B.	5	0	2	B.	B.	M.	..	+	..	+	..
Walsh, Anna	1889	..	..	G.	4	1	2	G.	G.	F.	Dead	..	..	+	..
											2 yrs.	..	..		
Clancey, Mary	1901	..	..	..	3	0	..	..	..	..	..	..	..	..	+
Dorsey, Adeline	Oct. 24, 1896	..	4	B.	6	1	3	B.	B.	G.F. and S.	1 yr.	+	..	+	..
Preus, Charles	Sept. 24, 1903	2	..	..	2	0	2	G.	G.	F.	..	..	+	..	+

Oral Hygiene (Including Daily Toilet of Mouth, Condition of Gums).	Number Reported on.			
	32	9	13	54
Good	1	4	1	6
Bad	31	5	12	48

Abnormal Pulmonary Condition	Number Reported on.			
	33	23	35	91
Present in	3	1	10	14

Tonsils.	Number Reported on.			
	33	31	37	101
Number hypertrophied, including any tonsil with enlarged follicles protruding or submerged	26	25	32	83

FIVE INDIVIDUAL RECORDS.

Measurements.				Defects of:						History of Child.										
Height.	Weight.	Chest.	Abdomen.	Nutrition.	Glands.	Posture.	Chest.	Ribs.	Scapulæ.	Teeth.	Oral Hygiene.	Lungs.	Tonsils.	Adenoids.	Nasal Fossæ.	Calmette.	Instillation.	Reinspection.	Reaction.	Operations Performed.	Condition Six Months Subsequent.
43½	50	20²	21	B.	+	B.	B.	B.	B.	G.	G.	0	0	0	0	+	3:14:08	3:15:08	+	+	..
..	..	..	..	B.	+	B.	G.	G.	G.	G.	G.	0	+	+	+	0	..	..	..	+	No cough—seems better
..	..	..	..	..	..	..	..	..	..	B.	B.	+	+	+	+	0	..	..	..	Adenoids and tonsils	No coughing since operation.
53	58	23	22	B.	+	B.	B.	B.	B.	B.	B.	+	0	+	+	+	2:4:08	2:5:08	+	..	..
..	34¾	21½	..	..	+	B.	B.	B.	B.	..	..	..	+	+	+	0	..	..	..	T., Ad., Uvula. Dec. 28., 1907	..

Adenoids.	Number Reported on.			
	33	31	37	101
Number present	32	27	37	96

Defective Nasal Breathing	Number Reported on.			
	33	29	35	97
Number obstructed	33	25	35	93

Number of Calmette Tests Applied.	Number Reported on.			
	30	7	6	43
Number positive	16	3	2	21

(Degrees of reaction stated in reports on each individual.)

Operations Performed.	Number Reported on.			
	33	31	37	101
Includes tonsillotomy, adenoidectomy, turbinectomy	5	5	3	13

A study of this summary shows that every individual is exposed to an association of predisposing factors. A study of the individual report shows that good home surroundings with a defective body are likely to yield positive reaction to the tuberculous conjunctival test; bad home surroundings with body clear, no reaction. The numbers, of course, are too small to do more than indicate a profitable field of inquiry.

The tonsils of some of the cases reported on, were sent to the Research Laboratory. The tissues were injected into guinea-pigs and the following report submitted:

"New York, May 21, 1908.

"My dear Doctor Cronin:

"Dr. Park asked me to let you know the results of the injections of the tissue you sent us, they are as follows:

"Thomas White .....tuberculosis positive.
"Frank Reehill .....negative.
"Theresa Solomon .....no results, through loss of pig.
"Leonard Solomon ....pigs not yet autopsied.

"The strain from White appears very promising. If you have any more material of the same type, we should be glad to have it.

"Yours truly,
(Signed) "Charles Krumwied, Jr."

It seems from the above report that the tonsils and adenoids may be primary foci of infection. Tissues are sent only from such cases as show a positive tuberculin reaction. As a sort of control on the positive reaction of those from tuberculous homes, some 300 school children who came to the Good Samaritan Dispensary for removal of adenoids and tonsils were systematically subjected to the tuberculin test; there was no positive reaction noted. Not all the cases were reëxamined, but personal experience shows that if you do anything to a child's eye, the slightest disturbance of the eye will result in a revisit. The subsequent eye test, after removal of tonsils from those cases previously positive, was limited to a few cases. One boy, Perlman, in six months gained 15 pounds and had 2½ inches more expansion; a later test, six months subsequent (other eye used), showed positive reaction. No physical signs were found.

I apologize for the few cases reported on. The report does not represent the labor exerted to get a greater number. All the cases were visited at their homes. I have made as many as eight visits to get one case.

The addresses were obtained from Department of Health records, and removals were so frequent that few of the cases looked up could be found.

To conclude: Obstructions of the head cavities prevent nutritional and developmental growth; they offer a favorable lodgment for tubercle bacilli and may furnish a primary focus of the disease. The growth, development, and vital resistance of the child are strengthened after removal of the obstructions. A very high percentage of children from tuberculous homes are constantly exposed to the disease, and the children affected can scarcely expect to escape the disease. Laws should be made to enable the authorities to relieve such children of their obstructions and at the same time remove the source of contagion.

THE PLACENTAL TRANSMISSION OF TUBERCULOSIS.

By Dr. Aldred Scott Warthin, Ph.D.,
Professor of Pathology in the University of Michigan, Ann Arbor, Michigan.

The prevailing opinion concerning congenital tuberculosis, according to our text-books, is that it is a pathological rarity, constituting a practically negligible factor in the etiology of tuberculosis. That tubercle bacilli may pass the placenta into the fetus, and that tuberculous lesions may occur in the placenta, are now established and accepted facts, and are recognized as such. Of this form of parental transmission of tuberculosis we are sure, but the practical world of medicine looks upon it as an extremely rare occurrence. The old positive teachings concerning the inheritance of tuberculosis have almost wholly given place to negative dicta concerning this point. As a result of the current teachings regarding "non-inheritance" of tuberculosis there can be but little doubt that of recent years there has been an increasing laxity concerning marriage and pregnancy in the case of tuberculous women. Even when the personal risk has been pointed out, the desire for maternity has led many tuberculous women to undergo pregnancy in the belief that the progeny would not necessarily be tuberculous.

It becomes a question of importance, therefore, if we have not gone too far in our statements and have given a wrong impression. That there can be no "true heredity" of tuberculosis we, of course, recognize, since tuberculosis is due to an extrinsic agent. But the statement "no heredity in tuberculosis" cannot be taken to mean "no maternal transmission." This latter thing is a definitely proved occurrence. Not only this, but it is highly probable that a tuberculous woman becoming pregnant will transmit the bacillus to her child *in utero*. Everything favors such a possibility.

The actual number of observed cases of placental tuberculosis is but thirty, and the cases of congenital tuberculosis in which the intrauterine transmission is beyond any doubt are even fewer. The small number of these observed cases cannot, however, be taken as an absolute criterion of the frequency of occurrence. It is highly significant that the cases of placental tuberculosis have been seen by relatively a small number of observers,

Schmorl and Geipel alone having seen nearly a third of the cases. The conditions do not favor the easy recognition of placental infections. Relatively few placentas are systematically examined, and the immense amount of time and labor necessary for the thorough examination of one before a negative result can be given limits decidedly the number of such examinations.

The writer believes that if thorough and systematic examinations of the placentas of all tuberculous mothers could be carried out, there would be a surprisingly large number of cases of placental tuberculosis reported—simply because the conditions favor its occurrence. We know that tubercle bacilli enter the blood of tuberculous individuals, and that they pass into the semen, urine, and other discharges even when there is no local lesion. Even when the primary focus is small, at certain stages tubercle bacilli pass into the blood-stream. This event is particularly likely to happen in the case of a tuberculous mother becoming pregnant. Under the changed metabolism of the pregnant condition small and non-active tuberculous foci are particularly likely to become more active and the process to spread. This is a common clinical observation. Many writers emphasize the harmful influence of pregnancy in its influence in kindling anew a quiescent process. It is during such exacerbations of activity that the tubercle bacilli are particularly likely to enter the blood-stream.

Once in the blood-stream of the pregnant woman the bacilli are particularly likely to drop out of the circulation in the slowly moving blood-stream of the large placental sinuses. Coming into contact with the endothelium of the decidual sinuses local necrosis or degeneration of the latter may ensue. This is followed by a thrombosis, and the formation of a tuberculous decidual lesion is initiated. In the intervillous sinuses the same thing may occur. The bacilli lodging upon the syncytial layer of the chorionic villi produce in this layer degeneration and necrosis, leading to thrombus-formation in the maternal blood-spaces. We know now that the chorionic syncytium possesses no especial resistance to the tubercle bacillus or to the majority of the infections. It is no more immune to the action of the tubercle bacillus than is the vascular endothelium in any part of the body. On the contrary, it would appear from the cases so far observed that the chorionic ectodermal covering is easily injured by the bacilli gaining entrance to the placental sinuses. Further, we know now that the placenta is no sure filter of the microörganisms or their proteins circulating in the maternal blood. Pathogenic bacteria may pass the syncytium without producing in it any apparent lesion, and the chorionic covering is unable to hold back any proteins circulating in the maternal blood. This is true of the tubercle bacillus, its aggressins, and its poisons. It must not be forgotten that the chorion is in a state of constant retrogression and proliferation. Even from the earliest stages of

pregnancy, degeneration and necrosis of some of the villi and thrombosis of the intervillous spaces occur. Infarcts may be formed at any period, but are more common after the first half of pregnancy. Such physiological lesions offer weak spots in the protective capacity of the placenta, and through such syncytium of lowered vitality microörganisms may pass and retain their virulence.

The placental transmission of tuberculosis depends upon the passage of tubercle bacilli through the placenta. Associated with this passage of the infective agent are the complex factors of the transmission of toxin, antitoxin, aggressin, antiaggressin, bacterial protein, etc. One or all of these factors may play a part in the problem. We are concerned here, however, with the transmission of the infective agent—the tubercle bacillus. Its passage may be direct from the maternal blood to fetal without placental lesions, or the latter may be formed and from these the bacilli may pass into the fetal circulation. In any given case both events may take place.

In the case of the bacillus passing the syncytium without apparent damage to the latter, we are unaware of the exact mechanism by which this occurs. It is probable that the process is wholly like that occurring in the passage of tubercle bacilli through an uninjured intestinal mucosa. The bacilli may be taken up by leukocytes or the syncytium itself may perform phagocytosis. It must not be forgotten also that some writers ascribe to the tubercle bacillus an active rôle in passing through the intestinal wall, and this, if true, would apply also to its passage through the placenta. At any rate tubercle bacilli may be demonstrated in the syncytium, in the interior of villi, and in the chorionic vessels in the entire absence of any lesions of the same.

With the pathology of placental tuberculosis we are now in a position to become fully familiar. The studies of Schmorl and Geipel and those of the writer have given us a fairly complete pathology of placental tuberculosis, and we know that it manifests itself in five forms: (1) Decidual, (2) intervillous, (3) intravillous, (4) intravascular chorionic, (5) chorioamniotic. Of these, the most common forms are the decidual and intervillous lesions.

1. Tuberculosis of the decidua is characterized by an absence of tubercle-formation. As a result of the lodgment of tubercle bacilli upon the endothelium of the decidual sinuses there is a local necrosis of the endothelium, followed by the formation of an agglutination-thrombus in the sinus. Following this there is a secondary caseation. Giant-cells and epithelioid cells are apparently not formed by the decidua or endothelium of the decidua. Tubercle bacilli passing out of the blood-stream into the decidua cause a focal degeneration and necrosis of the decidual cells. Such areas are easily distinguished in the stained sections by their darker staining, greater density,

and abundance of fibrin. They are always surrounded by a zone of necrobiosis containing numerous disintegrating leukocytes. The nuclear karyorrhexis is a distinguishing feature of these foci. In the later stages of the process the centers of the foci may show complete caseation and a partial liquefaction. Such older tuberculous foci might easily be mistaken for small abscesses, but the absence of polynuclear leukocytes in numbers and the character of the changes in the tissue immediately surrounding such foci make the differential diagnosis not difficult.

In this place I wish to record a new case of decidual tuberculosis:

Patient, woman aged thirty-seven, mother of seven healthy children and in second month of eighth pregnancy, began to show marked emaciation, fever, and general weakness. Diagnosed as "cancer of the stomach" and sent to the University Hospital for operation. On arrival her condition was so serious that a complete examination was not possible, but the diagnosis of cancer of the stomach was rejected, and that of typhoid fever or acute tuberculosis considered. Patient died a few days after entrance. The autopsy showed an advanced tuberculosis of the oviducts and uterus and an acute general miliary tuberculosis. The uterus was as large as the uterus of four months' pregnancy. On opening it no trace of fetus could be found. The decidua was hyperplastic and contained numerous large, soft, caseous areas. Similar caseous areas were found throughout the uterine wall. The microscopical examination showed an advanced tuberculous caseation of decidua and large caseating tubercles throughout the uterine wall. No history of any symptoms of abortion could be obtained, but no trace of fetus or chorion could be found.

The absence of tubercle-formation in the decidua of this case is in accord with the previous observations concerning decidual tuberculosis. In the cases reported by Runge, Westenhoeffer, Schmorl and Geipel, and Wollstein, and in my previously reported cases, the decidual lesions of tuberculosis have all been of the nature of a caseation necrosis associated with thrombosis and without epithelioid and giant-cell formation. Only in the deepest layer of the decidua or in the immediate neighborhood of a chorionic villus are epithelioid and giant-cells found invading decidual caseous foci. The peculiar character of the decidual cells must be regarded as sufficient reason for their failure to form reactive tubercles.

2. The intervillous tubercles are the result of tubercle bacilli lodging upon the syncytium and causing in the latter a local degeneration and necrosis. Following this there is formed upon the damaged syncytium an agglutination-thrombus of red cells and leukocytes, the latter of which quickly show karyorrhexis. Fibrin-formation occurs, and there is found in the intervillous space, but attached to the syncytium at point of damage, a deeply staining, dense, granular mass staining a violet-red (hematoxylin and eosin) and containing numerous chromatin granules and karyorrhexic leukocyte

nuclei. From the stroma of the villus epithelioid and giant-cells may now enter the agglutination-thrombus, and it may become wholly or partly organized into an intervillous tubercle. Secondary caseation of the tubercle thus formed may now take place. In other instances caseation of the agglutination-thrombus proceeds without the formation of a tubercle. The difference in process is probably due to variation in the virulence of the given infection.

3. Intravillous tubercles are formed in the stroma of the villi by tubercle bacilli passing the syncytial layer and lodging in the tissue-spaces of the stroma of the villus. At the point of growth of the bacillus there is formed a primary degeneration or necrosis; this is followed by the development of a tubercle presenting the general appearances of tubercles elsewhere in the body and showing the same course.

4. Intrachorionic vascular tubercles are formed in the chorionic vessels by tubercle bacilli gaining entrance to the fetal circulation and lodging upon the endothelium of the vessels of the chorion. Here the process is repeated: first, a primary degeneration or necrosis of the endothelium at point of lodgment of the bacilli, then the formation of an agglutination-thrombus, its secondary caseation, or its organization into an epithelioid tubercle with subsequent caseation. The process is essentially the same as that of intravascular tubercle-formation in any part of the body.

5. Chorioamniotic tubercles are rare. They usually arise primarily in the chorionic villi adjoining the amnion, and involve the latter by direct continuity or contiguity. Their manner of formation is identical with that of the chorionic tubercles and the after-changes are the same. Primary tuberculous foci of degeneration may also be found in the amnion; the development of these into tubercles has not yet been observed in any of its stages. Even in the most extensive miliary tuberculosis of the placenta the amnion may fail to show any tuberculous lesions, although the amniotic fluid may contain tubercle bacilli in large numbers.

In brief these are the most essential features of the pathology of placental tuberculosis. As I have said before, of this form of maternal transmission of tuberculosis to the progeny we have now abundant and conclusive proof. The main question now before us is the frequency of such an event. It will be manifestly impossible to secure accurate statistics in regard to a point the investigation of which is attended by so many difficulties. But there are very good reasons for believing that pregnancy in a tuberculous woman is attended not only by danger to herself, but by the very grave danger of the placental transmission of the disease to the offspring. The most important of these reasons are as follows:

1. Tuberculous individuals, even in the presence of a small active focus, give off active bacilli into the blood-stream.

2. Under the influence of pregnancy there is especial danger of an old quiescent tuberculous focus again becoming active and giving off bacilli into the blood-stream.

3. Tubercle bacilli circulating in the blood of the mother are particularly likely to fall out of the circulation in the large placental sinuses.

4. The decidua and the chorionic syncytium offer no especial resistance to the tubercle bacillus. They have no special immunity, and are affected by the agents of infection in the same way as is the vascular endothelium in any other part of the body.

5. Active tubercle bacilli may pass through the placenta into the fetal circulation without causing any placental lesions.

6. From placental lesions large numbers of tubercle bacilli may enter the fetal circulation.

The passage of tubercle bacilli through the placenta without producing pathological changes in that organ has an important bearing upon the subject of latent congenital tuberculosis. Further, it has been positively shown that the fetal blood may contain tubercle bacilli in large numbers without tuberculous lesions being produced in the fetal tissues. Such an occurrence can easily be explained on the ground of an acquired aggressin-immunity on the part of the fetus. The passage through the placenta of tubercle aggressin in small amount, for a long period of time, would produce in the fetus an aggressin-immunity, and so permit the presence in the fetal blood of tubercle bacilli without the production of lesions, or the latter, if produced, might be very slight and of slow development. A toxin-immunity may also be produced. Latency in the fetus or child, of bacilli obtained from the mother, is both possible and probable.

In conclusion, we must substitute for our dictum "no inheritance in tuberculosis," the warning "maternal transmission of tuberculosis is likely to occur," and we should modify our extreme statements concerning the frequency of congenital tuberculosis. If tuberculosis is to be exterminated, all modes of infection and spread must be guarded against, hence marriage and maternity in the case of tuberculous individuals should be prohibited or avoided.

La Trasmicion de la Tuberculosis por Medio de la Placenta.—(WARTHIN.)

Esta condición generalmente considerada de una raresa extrema. Analisis de los casos reportados. Nuevos casos del autor. Las doctrinas del presente, que niegan la transmición hereditaria de la tuberculosis, es responsable de la poca atencóin que se da a los asuntos de matrimonio y embarazo en los casos de las mujeres tuberculosas. Tuberculosis congenital como un

resultado de transmicion por medio de la placenta. En la mujer tuberculosa, durante el embarazo, aun en los primeros estados de la infección, las condiciones son favorables a la entrada del bacilo de la tuberculosis en el torrente circulatorio y de este a los tejidos de la placenta. Una vez el bacilo en el seno de la placenta, este puede ser llevado por la circulación bien á la decidua, al endotelio o bien al corio.

El corio no presenta resistencias especiales al bacilo de la tuberculosis, sino que á lo contrario es deñado facilmente por el bacilo, el cual pasa, á los vasos sanguineos de la placenta. Estos no son mas inmunes á la acción del bacilo de la tuberculosis que lo es el endotelio vascular de cualquier otra parte del organismo. La acumulación del bacilo acitvo, da origen á una degeneracion y necrosis en el sitio de la infeccion, esta á la vez da lugar á la aglutinación de un coagulo, el cual mas tarde llega a organizarse en la forma de un tuberculo con sus celulas epiteleales y gigantes, traidas por medio de la circulación. Una degeneración secundaria caseosa puede tambien ocurrir. El bacilo de la tuberculosis puede tambien pasar al traves de los tejidos sin presentar daños aparentes.

La tuberculosis en la placenta se manifiesta bajo cinco formas:—(1) Decidual; (2) Intervellosa; (3) Intravellosa; (4) Intravascular en el corio; (5) Corio-amniotica. Las mas comunes son las lesiones deciduales e intervellosas. En el caso en que la decidua es afectada, la formación de tuberculos es absente, las lesiones de la decidua, consisten de una area de necrosis y coagulo localizado sin la formación de celulas epiteloales ni gigantes. El primer evento en estas lesiones es la necrosis del endotelio de los senos de la decidua, en los puntos donde se encuentra alojado el bacilo de la tuberculosis. En las lesiones intervellosas la necrosis es el primer evento. Las lesiones del endotelio ocasionan la formación de un coagulo hialino que, mas tarde puede transformarse en un tuberculo epitelial. El mismo fenomeno presentan las lesiones de los vasos del corion.

Aunque el bacilo de la tuberculosis puede pasr al traves de la placenta sin producir lesiones aparentes, la ausencia de estas, sinembargo, no justifica que el feto haya escapado la infección. En los casos de infecciones de la placenta, las probalidades son que el bacilo de la tuberculosis haya entrado en la circulacion del feto. En el torrente circulatorio del feto el bacilo puede encontrarse en gran numero, sin que por esto cause lesiones locales.

En conclusion, la ocurrencia del embarazo en la mujer tuberculosa, favorece la entrada del bacilo de la tuberculosis en el torrente circulatorio y en los senos de la placenta. La placento no es un filtro perfecto para los microbios ni tampoco poseé una immunidad especial contra el bacilo de la tuberculosis. La transmicion de la tuberculosis por medio de la placenta, es un factor definitivo y no una rara posibilidad en la etiologia de la tuber-

culosis congenital la cual, auque relativamente rara, es mas frecuente que como se cree, y debe considerarse como una posibilidad definidad en todo caso en el cual la cuestion de matrimonio y embarazo de la mujer tuberculosa se tome en consideración.

Transmission de la Tuberculose par le Placenta.—(WARTHIN.)

État présent de la question de la tuberculose congénitale. Cette forme est considérée d'habitude comme extremement rare. Analyse des cas rapportés jusq'uà présent. Cas nouveaux vus par l'auteur. L'enseignement concernant la non-hérédité "de la tuberculose, est résponsable de l'indulgence trop grande dans les mariages des tuberculeux et dans la grossesse des femmes tuberculeuses. La tuberculose congénitale est le résultat de la transmission du bacille par le placenta. Chez la femme tuberculeuse enceinte, même dans la première phase de l'infection, il y a des circonstances qui favorisent l'entrée des bacilles dans le courant de la circulation et de là dans les sinus placentaires. Là, les bacilles peuvent sortir de la circulation, soit en passant dans l'endothélium de la membrane décidue soit dans le syncytium du chorion.

Le syncytium du chorion n'a pas de résistance spéciale à opposer au bacille de la tuberculose. Au contraire, il semble être facilement blessé par les bacilles, qui entrent ainsi dans les sinus placentaires. Le syncytium n'est pas plus immun à l'action du bacille que ne l'est l'endothélium vasculaire de n'importe quelle partie du corps. La colonisation de bacilles actifs sur le syncytium est suivie de dégénéresence et de nécrose du syncytium, au point où les bacilles s'établissent. Après, formation d'une thrombose d'agglutination sur le syncytium endommagé. Cette thrombos s'organise plus tard et devient un tubercule, les cellules épithéloides et les cellules géantes provenant du tissu de la villosité. Dégénérescence caséeuse peut avoir lieu ensuite. D'un autre côté, les bacilles peuvent passer le syncytium sans l'endommager, selon toute apparence.

La tuberculose du placenta se manifeste par cinq formes: (1) Tuberculose de la membrane décidue; (2) intervilleuse; (3) intravilleuse; (4) intravasculaire chorionique; (5) chorio-amniotique. Les formes les plus communes sont les lésions de la membrane décidue et les lésions intervilleuses. Dans le cas des lésions déciduelles, des tubercules ne se forment jamais, la lésion consistant en une région où la nécrose et la thrombose se localisent sans qu'il y ait formation de cellules épithéloïdes et de cellules géantes. Le premier phénomène de cette lésion est la nécrose de l'endothélium du sinus déciduel, qui a lieu au point où le bacille s'est établi. Dans les lésions intervilleuses, la nécrose syncytielle a lieu d' abord. Les lésions de l'endothélium ou du syncytium conduisent à la formation de thromboses hyalines

ou par agglutination, lesquelles, plus tard, peuvent se transformer en tubercules épithéloïdes. Le même procès a lieu dans les lésions provenant des vaisseaux du chorion.

Puisque les bacilles peuvent passer le placenta sans causer des lésions locales, l'absence de ces dernières ne signifie pas que la foetus a été sauvé de l'infection. Naturellement où il y la des lésions placentaires, il est beaucoup plus probable que des bacilles soient entrés dans la circulation foetale. Les bacilles peuvent se trouver en grand nombre dans le courant foetal, sans provoquer des lésions locales. Il est très probable que des infections "latentes" du nouveau-né peuvent avoir lieu.

Conclusion: La grossesse d'une femme tuberculeuse favorise l'entrée des bacilles de la tuberculose dans la circulation, et puis dans les sinus placentaires. Le placenta n'est pas un filtre parfait pour les microorganismes. Elle n'a pas d'immunité spéciale contre le bacille de la tuberculose. La tuberculose congénitale comme résultat de la transmission placentaire est un facteur défini dans l'étiologie de la tuberculose est on ne peut pas l'ignorer en disant simplement que c'est une rare possibilité. Quoiqu'elle soit rare relativement, elle est plus commune qu'on ne le suppose et on ne doit pas l'oublier là où il faut considérer les questions du mariage et de la grossesse de femmes tuberculeuses.

Die Placentar-Übertragung der Tuberkulose.—(WARTHIN.)

Gegenwärtiger Stand der congenitalen Tuberkulose. Diese Kondition für gewöhnlich als ausserordentlich selten angesehen. Analyse der berichteten Fälle. Neue Fälle vom Autor. Mitlaufende Lehren bezüglich der "Nicht-Erblichkeit" der Tuberkulose verantwortlich für anwachsende Laxheit bezüglich Heiraten und Schwangerschaften in den Fällen tuberkulöser Frauen. Congenitale Tuberkulose das Resultat einer placentaren Übertragung. Bei der schwangeren tuberkulösen Frau, selbst in dem frühen Stadium der Infektion, begünstigen Zufälle den Eintritt von Bazillen in den Blutstrom und von da in die Sinusse der Placenta. Hier können die Bazillen aus der Zirkulation sich entweder in das Endothel der Decidua oder in das Zellengewebe des Chorions begeben.

Das Zellengewebe des Chorions besitzt dem Tuberkelbazillus gegenüber keine besondere Widerstandskraft. Es scheint im Gegenteile leicht durch die Bazillen verletzt zu werden, welche Eintritt in die Sinusse der Placenta gewinnen. Es ist gegenüber der Tätigkeit des Tuberkelbazillus nicht mehr immun, als das gefässreiche Endothel in irgend einem Teile des Körpers. Das Lasten der Bazillen auf dem Syncytium zieht eine Degeneration und Nekrose des Syncytiums auf dem Belastungspunkte nach sich.

Dieser Thrombus organisiert sich später in einen Tuberkel, da die Epithel- und Riesenzellen von dem Stroma des Villus kommen.

Es mag auch zu secundärer Verkäsung kommen. Tuberkelbazillen können auch anscheinend, ohne eine schädliche Wirkung zu zeigen, durch ein Syncytium passieren.

Die Tuberkulose der Placenta tritt in 5 Formen auf:

(1) Decidual; (2) Intervillös; (3) Intravillös; (4) Intravasculär chorionisch; (5) Chorio-amniotisch. Die gewöhnlichsten Formen sind die decidualen und intervillösen Verletzungen. In den Fällen der ersteren bilden sich niemals Tuberkel, da die decidualen Verletzungen aus einer örtlich begrenzten Fläche von Nekrose und Thrombose ohne die Bildung von Epithel- oder Riesenzellen bestehen. Der primäre Effekt in dieser Verletzung ist die Nekrose des Endothels der decidualen Sinusse an jenem Punkt, an dem sich der Tuberkelbazillus eingestellt hat. In den intervillösen Verletzungen ist Nekrose des Syncytiums der primäre Effekt. Die Verletzungen des Endothels oder Syncytiums führen zu der Bildung hyaliner oder agglutinirter Thromben, welche später in Epithel-Tuberkel verwandelt werden können. Derselbe Prozess kommt in den Verletzungen vor, die sich in den Gefässen des Chorions ergeben.

Seitdem Tuberkelbazillen die Placenta passieren, ohne lokale Verletzungen zu verursachen, giebt die Abwesenheit der letzteren noch kein Zeichen, dass der Fötus der Infektion entwischt ist. In den Fällen placentarer Verletzungen sind die Möglichkeiten unendlich grösser, dass Bazillen Einlass in die fötale Zirkulation erlangen. Im fötalen Blutstrom können sie in grosser Anzahl, ohne lokale Verletzungen zu verursachen, vorhanden sein. Das Vorkommen "latenter" Infektionen der Neugeborenen ist sehr leicht möglich.

Zur Schlussfolgerung: das Vorkommen der Schwangerschaft einer tuberkulösen Frau begünstigt den Eintritt von Tuberkelbazillen in den Blutstrom und von da in die Sinusse der Placenta. Die Placenta ist kein genügender Filter für Mikro-Organismen. Sie besitzt keine besondere Immunität gegen den Tuberkelbazillus. Angeborene Tuberkulose als das Resultat placentarer Übertragung ist ein bestimmter Faktor in der Ätiologie der Tuberkulose, und kann mit ihrer entschiedenen Erkennung nicht als eine sehr seltene Möglichkeit bei Seite geschoben werden. Während sie relativ selten ist, ist sie dennoch häufiger als man vermutet, und muss als eine bestimmte Möglichkeit in allen Fällen betrachtet werden, in welchen die Fragen der Heirat oder Schwangerschaft tuberkulöser Frauen in Erwägung kommen.

DE L'AIR CONFINÉ ET DE LA TUBERCULOSE.

Par M. L'Architecte Augustin Rey,
Membre du Conseil Superieur des Habitations à Paris.

Problème de L'Aération de la Chambre Habitée.

Lorsqu'il s'agit de tuberculose, l'étude de l'atmosphère confinée, en opposition avec l'atmosphère libre, devient de la plus haute importance.

La respiration, fonction fondamentale de la vie, quand elle s'accomplit à l'air extérieur a presque toujours une résultante mécanique et physique absolument normale.

Dans l'air confiné, il en est au contraire tout autrement.

Le mouvement aérien dans un espace clos, est si complexe, en apparence, qu'il permet difficilement de déterminer d'une manière précise, les phénomènes de chimie respiratoire pure qu'y s'y accomplissent.

Nos idées actuelles nous font considérer dans l'acte respiratoire, l'oxygène comme base de l'alimentation sanguine.

Y a-t-il un moment où la proportion de ce gaz par rapport aux autres éléments de l'air, parvient à déranger l'économie respiratoire? Il est incontestable que des accidents par asphyxie peuvent se produire, si dans un espace hermétiquement clos, on diminue ou on augmente notablement la proportion d'oxygène. La tension de ce gaz ne peut ni s'abaisser, ni dépasser un certain chiffre sans devenir dangereux. Ces conditions ne sont réalisables du reste, que dans des expériences de laboratoire, ou tout-à-fait accidentellement dans la Nature. Dans une atmosphère libre, elles ne se présentent, pour ainsi dire, jamais. Que l'on soit au bord de la mer ou sur de hautes montagnes, l'échelle des proportions entre l'azote et l'oxygène reste dans un rapport tel que l'organisme s'y acclimate.

De nombreuses expériences, il semble résulter que les variations constatées couramment dans nos habitations ordinaires, sont à peine sensibles. Il est établi que dans les conditions où sont la plupart de nos logements, le volume d'oxygène ne subit pas de diminution sensible du fait de ses occupants.

Comme pour l'oxygène, l'acide carbonique est en rapport avec la tension de l'atmosphère et non avec le volume qu'il occupe.

C'est la différence de tension entre l'oxygène dissous dans le sang et celui contenu dans l'atmosphère qui produit l'exhalaison pulmonaire.

* * * *

Il faut en conclure que les redoutables dangers de l'air confiné surtout en ce qui concerne la contagion Tuberculeuse, ne sont pas le résultat des proportions d'oxygène, d'azote, et d'acide carbonique, comparées, à celles de l'air libre. A tensions égales entre ces atmosphères, ces proportions varient relativement peu.

La véritable cause doit être recherchée dans la diffusion dans l'atmosphère confinée, de la matière organique rejetée par les poumons, et surchargée de vapeur d'eau. Gênée par la présence de ce toxique violent, l'action physiologique est peu à peu compromise par les effets morbides que produisent ces matières en suspension. Juxtaposée ou dissoute en partie dans les flancs microscopiques des goutelettes de vapeur d'eau expectorées, cette matière organique ne tarde pas à faire sentir ses effets.

Elle crée un véritable marecage aérien dans lequel, sans nous en apercevoir, nous sommes peu à peu complètement noyés. C'est un milieu de culture où les germes ne tardent pas à pulluler à l'infini.

Très variable en quantité et en qualité, suivant les individus, la toxine humaine est dans un rapport étroit avec l'exhalaison d'acide carbonique. L'azote, par sa masse même, qui forme les $\frac{4}{5}$ de l'atmosphère totale et en constitue l'élément gazeux le plus stable, y joue le rôle capital, an effet, de substratum naturel à tous les germes organiques inoffensifs ou patogènes.

Le seul poison de l'air confine, qui s'accumule lentement dans l'intérieur des habitations et finit par s'incruster sur tous les objets qu'il contient, est la matière organique. Produit de combustions intimes, déchet empoisonné d'actions biologiques qui nous échappent complètement et restent impénétrables, il faut à tout prix le combattre et l'espulser. La seule hypothèse plausible que l'on puisse faire sur l'origine de cette matière est de la considérer comme étant surtout composée de toxines dont se débarrassent tous les infiniments petits qui sont en nous, sous l'action respiratoire des poumons; ce rejet au dehors se fait avec une merveilleuse régularité et une énergie insoupçonnée jusqu'ici.

Ces détritus sont d'autant plus redoubtables que suivant les conditions de santé et de maladie de l'individu, ils acquièrent une nocivité autrement plus virulente que ceux provenant des reins, du foie ou de l'élaboration intestinale. Cette toxine véhiculée ou dissoute par la vapeur d'eau, se diffuse sous l'effet de la tension de l'air et imprègne toute la masse gazeuse respiratoire. L'oxygène lui, se renouvelle au fur et à mesure de sa consommation sous la pression extérieure qui pénètre de part en part l'habitation et à laquelle rien ne peut s'opposer. L'acide carbonique s'élimine de lui-même. La masse d'azote inerte qui ne subit d'autre influence que celle des differences

de temperature devient alors le support forcé de toutes les impuretés, des produits solubles de la vapeur d'eau, des germes organiques de tout genre, des poussières de toute nature. L'oxygène étant le destructeur de toute putrefaction organique, c'est l'azote qui est le véritable foyer de culture.

L'enveloppe d'air que la chaleur du corps emprisonne dans nos vêtements se charge aussi de tous les déchets de la transpiration cutanée, qui a beaucoup d'analogie avec celle des poumons. Si par une aération bien comprise ces déchets ne sont pas rapidement enlevés autour de notre corps, ils se transforment en germes nocifs et n'attendent qu'une occasion favorable pour penétrer dans l'organisme par toutes les portes qui peuvent s'offrir.

La souillure de l'azote semble donc nécessiter la purification des atmosphères confinés.

HIGIENE ESCOLAR EN EL ECUADOR.

By Dr. M. Jigon Bello,
Quito, Ecuador.

"A nuestro juicio, la medicina, no es tan elevada é importante, sino, porque en sus relaciones con los pueblos y los individuos ella regula los principios que física y moralmente, hacen la fuerza de las Naciones y la salud de cada uno en particular."—Bouchu.

Tomando como base esta doctrinal sentencia, abordaré en la presente publicación, un estudio para mi, de vital interés, que dice la salud, la longevidad, el mejoramiento de nuestra raza, por hoy y sucesivamente enclenque, valetudinaria y cuya vida media decrece día á día; me ocuparé por tanto de la manera como es tenida y educada la niñez que afluye á la Escuela, y cuyas pésimas condiciones de educacióm son causa, sino única, al menos la principal del deterioro orgánico, de la degeneración, no diré solo fisica sino aun moral que con pesar se nota aqueja á la generación actual.

Sabido es, que el niño es ser cuyos organos en via de desarrollo, exijen cuidados y medio adecuado para alcanzar su completo y perfecto desenvolvimiento, á manera que un vegetal que germina, requiere cultivo y labor esmerada, para cosechar fruto robusto y sazonado. Si se hace caso omiso, de la parte material del niño, si no le damos medios apropiados á su vida y crecimiento, habremos perdido en flor, existencias, quizá talentos que hubiesen formado el orgullo y la felicidad de su patria.

Para este último resultado, contribuyen por desgracia dos factores: 1. Una falsa idea y desmedida exigencia de los padres: 2. La incuria de los Gobiernos. Cuanto á lo primero, es sabido que los padres de un niño, creen que este es solo cerebro, que no domina en él, sino el espiritu, y que éste es el úni co al que están llamados á cultivar; su unica ambición la cifran en tener un sabio en miniatura; si posible les fuese ponerlo á la escuela desde el instante que el niño nace, no se excusarían ya que su orgullo sería tener un doctor de cinco á siete años; y para conseguirlo, no se paran en medio ninguno: salud, robustez desarrollo físico, son factores secundarios; sueño, digestión, recreo, son elementos dañinos; el niño debe sacrificarlo todo, ni dormir, ni comer, ni pasear si no es con el libro, y esto bajo pena de caer en descrédito, ante el padre, el maestro, y la sociedad, y merecer censura y castigo.

Por lo que toca á lo segundo, ningún Gobierno se ha tomado la pensión de dictar, un reglamento de escuelas que, guisdo por la razón y la ciencia, hubiese mirado por la salud, desarrollo y bienestar de la niñez, no: á mucha filantropía ha tenido el señalar textos, y una vivienda cualquiera, donde se acinen miles de niños, á sacrificar su vida, á trueque de alguna instrucción, que, en tiempos más remotos la daba algún individuo que, para ser buen maestro, debía ser bien bárbaro y tener como regla que: la letra con sangre entra; deduciéndose que la educación entre nosotros ha sido un martirologio completo.

El programa de escuelas que ha existido y existe es el siguiente: Horas de clase de 6 a. m. á 4 p. m., tiempo en que el niño como hecho de una pieza con el pésimo banco que le sirve de asiento, no tiene libertad ni para mover una pestaña, bajo pena de azotes. Termina el día, y parece que cesaría tan pesado cautiverio, no: el niño va á su casa, con el deber, es decir con una docena de cuadernos, lo menos, unos de gramática, aritmética, geografía; otros de matemáticas superiores, física, química, geologia, ciencias públicas, etc., etc.; y de los cuales en las cortas horas que debería serle de descanso, unos debe aprenderlos de memoria y otros escribirlos de cualquier manera y en variedad de letras: después de pasada media noche en cumplir con el deber, se entrega por fin el niño á un sueño turbado por la pesadilla del maestro, y vuelve á las cinco de la mañana á em prender su pesada tarea de las letras, y se encamina á la prisión, cargado de una biblioteca. Esto último, sin exageración, pues al registrarse la cartera de uno de nuestros esc olares no quedaría sin encontrarse todas las obras escritas en humanidades, literatura y ciencias. Al hallarlas, cualquiera asombrado exclamaría que, niño tan instruido y el maestro la lumbrera de la pedagogía, enseña lo que no es creible'; y el niño, diría yo de puro sabio no tardará en ver á Dios, pues consumido en su organismo, y llegado á la suma perfectibilidad, á fuer de martirio, estuidio y ciencia se hará digno de él.

Pero, y la sociedad para la que se le educa, y á la que tiene que ser útil? Ganará me responderán los maestros. Perderá les contestaré yo, y la prueba es sencilla: Las concepciones del espiritu, necesitan de un medio para sus manifestaciones, éste es el cerebro, y su mayor ó menor perfeccionamiento orgánico, decide del grado de capascidad intelectual de cada individuo; un cerebro bien organizado es elque nos da los sabios, y los incompletamente desarrolados, los idiotas, pues el espíritu á semejanza de un foco luminoso, trasmite su luz, tanto más nitida y brillante, cuanto más adecuado y perfecto es el medio por el que atraviesan sus rayos. Ahora, el desarrollo y perfeccionamiento de la masa encefálica, es sinérgico del que tenga el organismo en general, y relativo á aquel, el de la inteligencia; luego, un individuo débil, anémico, desgastado, será un neurópata, visionario, ilusionado ó cosa parecida, mas no un sabio, y para tenerlo tal, se hace menester que el desarrollo

orgánico del niño, sea completo, que su salud y bienestar sean cabales, entonces ese cerebro será apto para exteriorizar las operaciones del espiritu, con la lucidez propia á lo adecuado de su medio. Muy sabiamente dijeron:

Bacón "Para el alma humana, un cuerpo sano es un huésped, y un cuerpo enfermo un carcelero. Una salud inalterable liga estrechamente el alma al cuerpo."

J. J. Rousseau: "Las operaciones del cuerpo y el espiritu deben marchar de concierto y la una dirijir á la otra."

Platón El más agraíable espectáculo sería contemplar la perfección del alma y la del cuerpo, unidas entre ellas en perfecta armonía."

Persiguiendo este fin, toda nación culta y civilizada todo Gobierno solícito por el incremento, salud, robustez y bienestar de zu país, no ha omitido medio alguno para propender, á la par que, al cultivo de la inteligencia, al desemvolvimiento y desarrollo material del niño, buscándose un sistema de enseñanza que sin fatigar el espiritu, haga más fructuosa la instrucción colocándole en un medio que favorezca su salud, dotándole de lo necessario para que á la vez que se atienda á su desarrollo físico se impida su deterioro, y las mil deformacíones con siguientes á una escuela mal tenida d deficiente en su menaje.

Para conseguirlo, se me preguntará Porqué medios puede optarse? Respondo:

1. Dotando á las escuelas de locales amplios, espaciosos, ventilados, con pisos y paredes revestidos materiales de que sin producir polvo sean susceptibles de lavados; acondicionados de manera que aun la luz penetre en ellos sin incomodar ó dañar la vista del educando: con un menaje apropiado á la talla de los alumnos, de suerte que sentados y entregados á sus facnas, su posición y actitud sean normales, para evitar incurbaciones y deformidades físicas: disponiendo de huertos y jardines que proporcionen á los niños aire puro y oxigenado, que reintegre á su sangre el elemento de vida indispensable á su edad.

2. Imponiendo á los niños una labor intelectual proporcionada á su edad, constitución, temperamento y capacidad para el estudio.

3. Dividiendo cientificamente su trabajo mental con otro físico, en el que descansando el cerebro, se desarrolle el sistema muscular por medio de una gimnasia metódica, bien calculada y dirijida.

En nuestras escuelas, ninguna de estas condiciones se llena, y menos la última: gimnasios son desconocidos, y si alguna vez se tiene, es un trapecio, al que sin ejercicio ninguno preliminar y bien dirijido, se entrega brusca y bárbaramente á un niño, y del que no reporta en muchas ocasiones, más beneficio que una hernia, ó una caida, que le ocasiona lesiones, que le aleccionan para no volver á él jamás.

En resúmen, entre nosotros, el niño es solo un martir del anhelo de sus

padres y del afán científico de su maestro, quien únicamente, se propone hacer de su discípulo un Salomón, para quien son inoficiosos los cursos de enseñanza secundaria y superior, sin jamás preocuparse de la situación, extensión orientación del establecimiento; forma de la clase, su luz, aireación, ventilación, número de educandos en relación á su capacidad; naturaleza del moviliario, material escolar, tal como la clase de papel, caracteres y disposición tipográfica empleada, distribución y duración del tiempo de estudio, recreo, gimnasia, etc, etc, de suerte que al leer y revisar las monografías europeas que tratan de este ramo, y ver el anhelo y solicitud que se despliega por la niñez, causa pesar el recordar y ver, como se nos ha educado y educa en todas las escuelas sin exepción, sin que esto se deba á otro factor, que á la injuria y dejadez de las autoridades llamadas á velar en este ramo, y á proporcionar los recursos que demanda la educación bien comprendida.

Hoy el I. Concejo Municipal, que desde el año de 1897, viene preocupándose de la higiene del lugar, trata de implantar como en la Escuela Municipal Sucre, algo que, proporcionalmente á sus escasos recursos, remedie la antigua antihigiénica educación escolar, y para ello aun tiene colocados, algunos aparatos de gimnasia, y pedidos á Europa otros de tracción elástica, á fin de que el Profesor nombrado para el caso, organice este nuevo y necesario ejercicio hijiénico en la mencionada escuela, la que, no dudo será modelo para las demás; y no vacilo en creer que, también el S. Gobierno secundará la iniciativa del I. Concejo, y que, proporcionando á todas las escuelas nacionales, locales adecuados, provistos de todo lo que ha menester, para una educación en relación con las exigencias y adelantos modernos, reglamentará científicamente la enseñanza, marcando la edad en que un niño puede ser admitido á la escuela, condiciones de admisión basadas en la Constitución y salud del niño; horas de estudio y recreo, naturaleza de éste; materias limitadas de estudio que debe cursar; en una palabra, que en cada escuela, hará prácticos todos los preceptos científicos de higiene escolar, adelanto é innovación tanto más fácil de obtenerla cuanto que en ramo de pedagogía, nuestro país tiene maestros de reconocida notoriedad y competencia, y que nada dejarían que desear en punto á instrucción primaria, si se les diese para ser obedecida, una reglamentación científica y razonada; si dispusiesen de locales, recursos y medios adecuados para llenar su cometido; y si fuesen bien dotados, premiados, estimulados, de manera que el magisterio de enseñanza primaria, deje de ser como se dijo: empleo de los que no tienen oficio, para ponerlo á la altura que se merece la sublime misión de instruir, moralizar formar y colocar en la escala que le cumple, al ser que hoy se llama niño, y que, sin tales requisitos y cultura, no llegaría á llamarse hombre, y menos á formar los encantos, la felicidad y el orgullo de su hogar y su patria.

No terminaré esta ligera publicación sin encarecer también á los padres

de familia, se convenzan de la siguiente verdad emitida por Plutarco, en sus estudios, acerca de la educación de los niños, quien dice: Conozco padres que por demasiado amor á sus hijos, son realmente sus enemigos. Los hay, por ejemplo, que demasiado celosos de su más rápido progreso, y deseosos de verlos obtener una superioridad notable, les sobrecargan de un trabajo forzado, cuyo peso les anonada. Resulta de allí un desaliento que vuelve odioso todo estudio. Las plantas que moderadamente se rocían, crecen facilmente; pero el agua en abundancia las ahoga en germen. Así también, el alma se nutre y fortifica por un trabajo bien dirijido, y el exceso extingue y concluye sus más excelentes facultades. Conviene, pues, dar descanso á los niños, recordando que todo en la vida, está dividido entre la acción, el trabajo y el reposo. Se vela durante el día se duerme la noche. La paz sucede á la guerra, la calma á la tempestad. Los días de trabajo, son interrumpidos por días de fiesta: en una palabra, el descanso es la salsa del trabajo, viendo la prueba de ello, no solamente en los seres animados, sino aun en las cosas insensibles. Los arcos y las liras, tienen necesidad de ser distendidos para servir últimamente. En fin, el cuerpo no se sostiene sino por el cambio de sus menesteres y su nutrición, y el espíritu por la alternativa de su acción y reposo."

Ojalá este mal aliñado trabajo, contribuya al mejoramiento de esta descuidada rama de la higiene, y sea en beneficio de la niñez que forma las futuras esperanzas de nuestra Patria.

SECTION IV.

Tuberculosis in Children—Etiology, Prevention, and Treatment (*Continued*).

FOURTH DAY. MORNING SESSION.

Thursday, October 1, 1908.

THE OPHTHALMIC REACTION. CUTANEOUS REACTION. LUMBAR PUNCTURE.

The President, Dr. Jacobi, called the Section to order at ten o'clock.

THE VALUE AND RELIABILITY OF CALMETTE'S OPHTHALMIC REACTION TO TUBERCULIN FOR THE DIAGNOSIS OF TUBERCULOSIS AND THE DIFFERENTIATION OF TUBERCULOUS LESIONS FROM OTHER DISEASES IN INFANTS AND YOUNG CHILDREN.

By E. Mather Sill, M.D.,
New York.

In spite of the great advances that have been made in our knowledge of the etiology, diagnosis, and treatment of tuberculosis one-seventh of all deaths in animals and man are due to this disease, hence any new and practicable method for determining to a reasonably certain degree the presence or absence of a tuberculous focus in the body is hailed with the greatest enthusiasm.

Frequency in Childhood.—That tuberculosis in infancy and childhood is much more frequent than was formerly supposed, and that this frequency increases regularly with the age, has been shown by the autopsy records of many prominent authorities. Müller, of Munich, found tuberculosis present

in 40 per cent. of 500 children on whom autopsies were performed, and in 10 per cent. of these the children died from causes other than tuberculosis. Of 319 autopsies reported by Holt at the Babies' Hospital, 14 per cent. were tuberculous. These figures go to show the frequency of the disease in childhood and the difficulty of diagnosis.

That tuberculous conditions are so slight and obscure in many instances as to render diagnosis by the old methods impossible is instanced by the experiments of Loomis, who inoculated animals with the bronchial lymph-nodes of 30 persons dying from violence or acute diseases in whom no evidence of acute disease could be found in any other part of the body at autopsy, and from 8 of the cases he produced tuberculosis in the inoculated animals.

Until recently there was no means of proving the presence of a tuberculous lesion in the body, and thus many cases of children with incipient or latent tuberculosis, or with tuberculosis in regions other than the lungs, have remained undiagnosed, or were diagnosed as other diseases, and improper or no treatment instituted.

We now have at our disposal a fairly reliable and apparently harmless means of determining, with a reasonable degree of certainty, whether or not a tuberculous focus exists in a given case. This is the ophthalmic reaction to tuberculin. The important points of value in this new method of diagnosis are:

1. That tuberculosis reacts to the agent.
2. That non-tuberculous cases do not show this reaction.
3. That the test has an effect upon old cases of healed tuberculosis.

Method of Administration.—Our method of administration has been the same as that of Calmette, namely, one drop of a 1 per cent. sterile solution of the precipitated tuberculin being instilled into one eye, the lower lid being drawn well down and held for one minute after the instillation, so that the tuberculin is thoroughly diffused over the eyeball and conjunctiva. The same eye should not be used for more than one test, as it becomes sensitized, and therefore a second instillation in the same eye is of no diagnostic value. (The test should not, of course, be used in a diseased eye.) The lower lid is drawn down, and the conjunctiva and inner canthus are examined every hour or two, and the time and amount of reaction noted. Reactions varied in their time of appearance from three to sixteen hours after instillation, but in a few cases the reaction did not occur for from twenty-four to forty-eight hours, and in these cases it sometimes continued for several days.

Occasionally slight discomfort and a sensation as of a foreign body in the eye were experienced, but in the majority of cases no subjective symptoms were present. Usually a congestion of the palpebral and ocular conjunctiva occurred in a few hours, and the caruncle was hyperemic and

covered in some cases with a fibrinous exudate. Redness of the conjunctiva was not always present. As the reaction advanced lacrimation occurred, and a fibrinous exudate resembling pus collected at the inner canthus. The maximum of intensity was reached in from six to twelve hours. The patients did not complain of pain, but occasionally of a slight burning in the eye. The conjunctivitis usually showed signs of abatement in from eighteen to thirty-six hours, and a case lasting ten days was the exception.

Variety of Tuberculous and Other Conditions Tested.—The following diseases were tested for the ophthalmic reaction: (1) Pulmonary tuberculosis; (2) tuberculous glands of the neck; (3) tuberculous peritonitis; (4) tuberculous bone diseases of various kinds; (5) pertussis; (6) lobar pneumonia; (7) bronchopneumonia; (8) bronchitis (acute and chronic); (9) asthma; (10) rheumatism; (11) chorea; (12) nephritis (acute, following scarlatina); (13) endocarditis; (14) enteritis; (15) gastro-enteritis; (16) malnutrition; (17) marasmus; (18) anemia; (19) rickets; (20) congenital syphilis; (21) catarrhal jaundice.

Some observers have found that the ophthalmic reaction is present in congenital syphilis and rickets, but in my experience with these diseases, I have never seen a positive reaction except when complications existed.

The 14 cases tested were those clinically tuberculous, which included pulmonary tuberculosis where the bacilli were present, tuberculous peritonitis, tuberculous glands of the neck, and tuberculous bone disease; all gave positive reactions.

The very suspicious cases included those with suspicious signs in the chest, those with chronic bronchitis, with malnutrition and anemia, with chronically enlarged or suppurating glands of the neck, and those in whom there was a slight intermittent fever that could not be accounted for. Of these, 13, or 90 per cent., gave positive reactions. Less suspicious cases were those with anemia, malnutrition, enlarged cervical glands, or chronic bronchitis; also those showing a family history of tuberculosis, and in whom adenoids, hypertrophied tonsils, and possibly indefinite symptoms that might point to a tuberculous condition were present. Of these, there were 101, with 18 positive reactions. The age of the children tested was from three months to ten years, and the youngest that gave a positive reaction was five months old. The reactions that occurred in the infants were all mild. Of the 218 cases tested, 45 were positive and 173 negative. There were 8 severe reactions and 37 mild ones. In a number of cases a second test was made in the other eye, and it was found that all cases that reacted to the first test reacted also to the second. Conversely, cases that did not react to the first test did not react to the second. Practically all those giving positive reactions showed signs indicating the presence of tuberculosis in some form.

Of 54 cases under one year, 9 were positive.

Of 63 cases from one to three years, 15 were positive.

Of 38 cases from three to six years, 7 were positive.

Of 63 cases from six to ten years, 14 were positive.

All that were found clinically to be tuberculous gave positive reactions. Of the very suspicious cases, 90 per cent. gave a positive reaction; 18 per cent. of the less suspicious cases gave a positive reaction; and of the 89 cases with slight ailments and other diseases, none gave a positive reaction.

Schick, after exhaustive experimental work, believes that a local reaction is less likely to fail than a general constitutional reaction, and says that in no case where tuberculosis has been excluded has a local reaction been present.

Comby subjected 132 infants to the ophthalmic reaction; of these, 62 reacted and 70 failed to react. In 4 of those that reacted the autopsy confirmed the diagnosis of tuberculosis. In 6 cases that did not respond to the test autopsy showed entire absence of tuberculous lesions.

Barney and Brooke tested 321 soldiers, including 250 tuberculous cases, and got 98 per cent. of reactions in active cases, 23 per cent. in apparently cured cases, and 10 per cent. in non-suspects. This would seem to indicate that the reaction is dependent upon the tubercle poison in the body. The same observers consider that, in general, the diagnostic value of the ophthalmic reaction is as great as that of the Widal test in typhoid fever.

The reaction is of special value in diagnosis where slight signs at the apex of the lung exist, no bacilli being present in the sputum, or where no sputum is obtainable. It is of value also in cases in which the lesion is elsewhere than in the lungs, as, for instance, in the bones, glands, etc.

The test may indicate clinically active or clinically inactive tuberculosis, and thus, although a tuberculous focus may be present in the body it may be inactive, and the patient may be suffering from another disorder or be apparently well.

We know that tuberculosis in infancy and childhood is largely a disease of the lymph-nodes, and in this respect and in many other ways it differs from that seen in adult life, and is more difficult of diagnosis. We know also that virulent bacilli may be present during life and yet no lesions be found at autopsy.

As with the adult, so it is with the child: the earlier the diagnosis is made and the earlier treatment is instituted, the better will be the ultimate result.

In conclusion I would say that the ophthalmic reaction is a most valuable and reliable aid to the diagnosis of tuberculosis in children in its various and early forms, and one that is safe when used with care. While this test is not infallible, and should never take the place of a physical examination, it is often more accurate than the ear or percussing finger in early pulmonary

cases, and by demonstrating a negative result, is far more satisfactory than a negative sputum examination.

Although a few cases have been reported of permanent injury to the eye or prolonged inflammation of the conjunctiva, these occurrences have been exceedingly rare, and, taking into consideration the fact that this test has been used with safety in thousands of cases, the few ill results may, probably, be due to errors in technic, the test having been used in a diseased eye.

The ophthalmic reaction is a simple method of diagnosis that any practising physician can carry out, making it possible for him to confirm or exclude a diagnosis, with no danger of affecting a tuberculous lesion or causing constitutional symptoms.

El Valor de la Prueba Oftálmica de Calmette en los Enfermedades de los Niños.—(Sill.)

Metodo de administración y solución empleada.

Grado de la reacción de la conjuntiva. Edad de los niños. Variedad de las pruebas heshas en casos de tuberculosis y otras afecciones.

Algunas formas aparentes.

Concepto herroneo de la reacción. El valor de la reacción en el diagnóstico y el diagnostico diferencial. Ventajas de la reacción oftálmica.

La reacción cutanea de von Pirquet.

Réaction ophthalmique: sa Valeur pour le Diagnostic chez les Nourrissons et les jeunes Enfants.—(Sill.)

Méthode d'administration, solution employée. Quantité nécessaire pour la réaction conjonctivale. Age des enfants. Expériences sur les différences de réaction entre les cas de tuberculose et les autres maladies. Quelques fausses informations concernant cette méthode. Valeur de la méthode comme aide dans le diagnostic et dans le diagnostic différentiel. Avantages de la méthode conjonctivale sur la réaction cutanée de von Pirquet.

Der Wert und die Anwendbarkeit von Calmettes Ophtalmo-Reaktion für die Diagnose von Krankheiten bei jungen Kindern.—(Sill.)

Methode der Anwendung und verwendete Lösung. Intensität der conjunctivalen Reaktion. Alter der Kinder. Versuche über tuberkulöse und andere Zustände in Bezug auf ihre Verschiedenheit. Einige der früheren anscheinend unrichtig beurteilt in Bezug auf den Versuch. Der Wert des Versuchs als ein Hilfsmittel für Diagnose und Differenzialdiagnose. Vorzüge des Conjunctivalversuchs gegenüber der von Pirquet'schen cutanen Reaktion.

THE CUTANEOUS AND OPHTHALMIC TUBERCULIN TESTS IN INFANTS UNDER TWELVE MONTHS OF AGE.

By Henry L. K. Shaw, M.D.,
Clinical Professor of Diseases of Children, Albany Medical College, Albany N. Y

A working knowledge of clinical and laboratory aids to diagnosis is essential to the conscientious practice of medicine. The laity is fast becoming educated to the fact that a correct diagnosis is an essential and a necessary preliminary to successful treatment. The interest aroused by any new method of diagnosis or clinical test demonstrates the earnestness with which the profession aims to secure a correct diagnosis. In no disease perhaps is an early diagnosis more important and more difficult to establish, especially in early childhood, than in tuberculosis. The earlier the diagnosis is made and proper treatment instituted, the greater is the chance of recovery.

In incipient cases physical examination reveals little except to skilled observers. The presence of tubercle bacilli is detected only when the disease is well established, and it is with great difficulty that the sputum can be obtained from infants and young children. Cytodiagnosis, serum reaction, and the opsonic index require skilled laboratory workers. The subcutaneous injection of tuberculin has been relied upon by many, but this procedure is open to criticism and will never become popular. In making the test, a hospital and trained nurses are required, and it is not justifiable in a routine examination.

In April, 1907, von Pirquet, of Vienna, published the results obtained from cutaneous vaccination with tuberculin. He found a characteristic reaction in tuberculous individuals, and formally announced the discovery of the cutaneous tuberculin test. About a month later Wolff-Eisner, of Berlin, inspired by von Pirquet, published the results obtained from instilling a drop of a weak solution of tuberculin on the conjunctival mucous membrane. He found a constant and specific reaction in tuberculous subjects, and named it the conjunctival tuberculin reaction. A month after the publication of Wolff-Eisner's discovery, Calmette, of Paris, published a series of similar experiments, but undertaken independently, with identical results. He employed the term ophthalmic test. Moro, of Munich, recently

found that he could obtain a specific reaction on the skin of tuberculous individuals by simply rubbing in an ointment containing tuberculin. This he termed the percutaneous test. These tests all depend on the local effect of tuberculin on the tissues, and the vast amount of literature that has appeared in the past twelve months shows how eagerly the medical profession has grasped at a simple, harmless, and inexpensive method of obtaining an early diagnosis in that all too frequent disease, tuberculosis.

Pirquet employed the cutaneous vaccination on 147 infants under three months of age and had no reaction. Of 64 vaccinated from the third to the sixth month, 3 reacted positively. He concludes, as a result of his experiments, that the reaction is not common or specific in the first year of life, but becomes more frequent as the child grows older. Sperk, in the Escherich clinic, vaccinated 159 infants under five months of age with no reaction. Aronade vaccinated 47 infants under twelve months of age, and one infant reacted who was suffering from tuberculosis of the knee. Forty of these babies were suffering from various disorders, and only 7 were healthy. Rietschel had only one positive reaction in 80 infants under twelve months, and that was in a clinical case of tuberculosis. Two other infants had undoubted tuberculosis, but they gave no reaction either to the cutaneous or to the subcutaneous tests. Faludi vaccinated 195 new-born infants and their mothers with a 25 per cent. solution of tuberculin, and obtained 126 positive reactions in the mothers and not a single reaction in the babies. Prouff and Petit vaccinated 54 nursing babies, among whom were those of 12 mothers who gave a positive reaction. Feer vaccinated 70 infants under six months with no reactions, and 42 from six to twelve months with 3 reactions. One of these was clinically a case of tuberculosis, and 2 were considered suspicious. Langstein, in 100 vaccinations under twelve months of age, had only one positive reaction. This baby died, and the autopsy showed tuberculosis. Cannata had no reaction in 70 infants under six months of age, and 3 out of 42 infants from six to twelve months of age. Brückner obtained 3 positive reactions out of 31 infants vaccinated, and these all gave physical signs of tuberculosis. Engel and Bauer report 6 positive reactions in 48 infants. Five of these showed no clinical signs of tuberculosis and the subcutaneous tuberculin test was negative.

Many of the authors do not specify in their reports the exact age of the children. Czerny stated that all the vaccinations made on infants in his clinic under one year of age were negative, but the number of tests is not given. Baginsky, in a discussion, said that no infant in his hospital had reacted to the cutaneous test. All the observations referred to were made with the cutaneous test, and no detailed account of the ophthalmic test in young infants can be found in the literature. Comby made a series of experiments, and concluded that the age of the child materially influenced

the occurrence of the ophthalmic reaction. Under one year of age he was unable to obtain any reaction either in tuberculous or in non-tuberculous cases. Von Pirquet, Wolff-Eisner, and Moro all use and advocate the employment of tuberculin prepared from the human type of tubercle bacilli, whereas Calmette uses tuberculin prepared from the bovine type. This fact is not generally appreciated, as many of the advertised preparations of "tuberculin prepared according to Calmette" for the ophthalmic test are made from tuberculin of the human type. Of great interest in this connection is the work of Detre, of Budapest, who claims the possibility of a differential tuberculin reaction to determine whether the infection is of human or of bovine origin.

The writer made two series of tests on infants under twelve months of age at St. Margaret's House, Albany. This institution admits only infants under twelve months of age, who are sent there because of sickness, improper feeding, and the like. The first series of experiments were made on 47 infants, 14 of whom were under five months of age. A supply of tuberculin (human), especially prepared and donated by Dr. Baldwin, of Saranac, was employed, in dilutions of 1:100 and 1:200. The 1:200 dilution was used first, one drop being instilled in the left eye. There was no reaction in any of the babies. Two weeks later a drop of the 1:100 dilution was instilled in the same eye, with the same result. Shortly after this a cutaneous vaccination was made on the same infants, using tuberculin (human) furnished by Professor Veranus Moore, of Cornell University. Only one showed a slight reaction; this was an old case of empyema with a discharging sinus. The pus was injected in a guinea-pig, who died later of tuberculosis. It is of interest to note that the Baldwin tuberculin—1:200—gave a positive result in 8 older children with known bone tuberculosis.

A second series of tests were made at the same institution on 34 infants, 16 being under five months of age. In this series a drop of a 1 per cent. solution of bovine tuberculin was instilled in the left eye, and a drop of a 1 per cent. solution of human tuberculin in the right eye. No reaction occurred in either eye. Vaccinations were also made with both types of tuberculin, with no reaction. A drop of the full strength of bovine tuberculin instilled in the eyes of 4 infants produced absolutely no irritation.

The babies appeared to object more to the pulling down of the lower lid and the instilling of a drop of tuberculin in the eye than to the vaccination. It should be observed that the crying that occurred in the older infants might possibly wash away the tuberculin and render the test unreliable. There were no bad effects from either test. None of the 81 infants showed any physical or clinical signs of tuberculosis, and in 4 who died later no evidence of tuberculosis was found at the autopsy.

The results of my experiments on 81 infants under twelve months of

age show that no reaction to the ophthalmic test follows the use of either human or bovine tuberculin in solutions of various strengths. The cutaneous tests in the same infants gave one reaction. Bovine tuberculin was used in 34 cases with no reaction.

The status of both these tests seems to be more secure, and in older children and adults they are most important aids to diagnosis. In young infants, however, they cannot be said to be so reliable. Czerny, Binswanger, and Hamburger show that, of 1002 autopsies on infants under three months of age, tuberculosis was found in 23, or 2.3 per cent.; of 542 autopsies on infants from four to six months old, 62, or 11.1 per cent.; and of 463 on infants from seven to twelve months, 92, or 19.9 per cent. The published statistics show that less than 2 per cent. of all infants under twelve months of age react to either test or either type of tuberculin.

The cutaneous test is simple, easy of application, and absolutely without danger. Its use is preferable to the ophthalmic test, a number of instances of injury to the eye following this test having been reported.

A REPORT UPON ONE THOUSAND TUBERCULIN TESTS IN YOUNG CHILDREN.

By L. Emmett Holt, M.D., LL.D.,

Professor of Diseases of Children in The College of Physicians and Surgeons (Columbia University), New York.

The observations included in the following report were all made upon ward patients at the Babies' Hospital. Very few of the children were over three years of age, the majority being under two years. Nearly all the observations have been made in the past year. In the early part of the year, unless some positive contraindication existed, some test, most frequently the eye test, was used as a routine measure, in order to determine whether and under what circumstances reactions were obtained in healthy children, or in those at least presumably non-tuberculous. During the latter half of the period the tests have been chiefly used when there were some grounds for suspecting that tuberculosis existed. Routine tests proved of considerable value in revealing the presence of tuberculosis in cases not hitherto suspected. A positive reaction to the skin or eye test was immediately followed by a careful clinical study of the case to discover, if possible, any other evidence of tuberculosis. In a large proportion of such patients bacilli were found in the sputum, although in many only after prolonged search and repeated examinations, thus establishing the accuracy and the value of the test. In many patients further evidence was afforded by the development of definite signs of pulmonary disease.

The Ophthalmic Reaction.—The ophthalmic test was made 615 times; in most instances only one test was made in a patient, although in a few children, where the results were questionable, the test was repeated. The ophthalmic tests were all made with tuberculin obtained from the Rockefeller Institute, and which had been precipitated with 65 per cent. alcohol. Before using, it was freshly dissolved in a sterile saline solution. For the first half of these tests a 1 per cent. solution was used, for the latter half, a 0.5 per cent. Especial care was taken not to use the tuberculin in an eye that was the seat of any disease. As a further precaution, the hands of the children were bound during the first twelve hours, to prevent any rubbing of the eye.

In the following table are given the reactions in the different types of

cases. In the group marked Probably not Tuberculosis are included those in which no evidence of tuberculosis other than the reaction existed.

RESULTS IN 615 OPHTHALMIC TESTS.

Pathological Condition.	Positive Reactions.	Negative Reactions.	Doubtful Reactions.
Positive tuberculosis (autopsy or bacilli in sputum) 38	25	10 (9 dying or extremely sick children).	3
Probable tuberculosis (evidence: other tuberculin reactions, history, or physical signs.) 21	19	..	2
Probably *not* tuberculosis, ...555	2	546	7 (all slight).
Positively not tuberculosis (autopsy) 1	1	..	..
Totals 615	47	556	12

The clinical course which the reaction follows is its most diagnostic feature, and hence rather close observation of a patient is necessary or some of the milder reactions will be overlooked. There is usually congestion of the conjunctiva, with some swelling and an increased secretion of mucus, which is frequently very abundant, so that the lids are adherent. Pus-cells are seldom present, and repeated cultures revealed no microörganisms. The symptoms generally appear in from six to eight hours after the tuberculin in used, and reach their height in the first twenty-four hours, fading gradually. The usual duration of symptoms is from one to three days. In about 12 per cent. of the cases the reaction lasted somewhat longer than three days; in one case it lasted ten days, but in no case was the test followed by any unpleasant results. By comparison with the opposite eye, the existence of a reaction may in most cases be confirmed. There were, however, a few cases in which the symptoms were so slight that the results must be classed as doubtful.

I am aware that serious results with the ophthalmic test have occasionally been reported. The precautionary measures taken in this group of cases are, I believe, of considerable importance, and are largely responsible for the absence of unpleasant results. On account of the kind of observation necessary and the possible dangers connected with the eye test, it is not wise to employ it indiscriminately, for example, among the out-patients of a hospital.

The statement has been repeatedly made that young infants do not respond to the eye test. This was not borne out by our experience. Of this series of cases, positive reactions were obtained in 14 patients under

one year old, 6 of whom were under six months and 1 only two months old. So far as we could see, the character of the reaction and the frequency with which it occurred were not affected by the age of the patient nor by the extent or activity of the pathological process, but only by the susceptibility of the patient. In no cases were positive reactions obtained in dying children or in those suffering from extreme prostration. In this respect it corresponded with the other tests.

The Skin Reaction.—The skin test of von Pirquet was employed 217 times. It was made with crude tuberculin obtained from the laboratory of the New York Health Department, which was simply diluted with sterile water to a 25 per cent. strength. Three linear scratches were made, usually upon the extensor surface of the forearm, and the tuberculin was rubbed into the middle one. The skin was allowed to dry and then covered for a few hours with a piece of sterile gauze. The reaction usually began in from six to twelve hours, and only twice later than twenty-four hours. It reached its height in most cases in from twenty-four to thirty-six hours. The duration varied considerably. It was generally from two to four days, but not infrequently lasted a week or longer, fading slowly. Although it varied considerably in intensity, it was generally perfectly definite, and in no instance was the result considered doubtful.

A summary of the reactions obtained in the different pathological conditions is given in the following table. As in the table of ophthalmic reactions, Probably not Tuberculosis signifies no other evidence of tuberculosis existed than the reaction to the test.

RESULTS IN 217 SKIN TESTS (VON PIRQUET).

Pathological Condition.	Positive Reactions.	Negative Reactions.
Positive tuberculosis (sputum, autopsy or operation) 22	12	10 (9 dying or extremely sick children; 1 cured)
Probable tuberculosis (evidence: other tests, history or physical signs) 20	15	5
Probably *not* tuberculosis 172	6	166
Positively *not* tuberculosis (autopsy) 3	..	3
Totals 217	33	184

The reaction in general corresponded with the pathological condition, the exceptions being the second and third groups of cases, in which we had no means of determining definitely as to the reliability of the reaction.

The skin test possesses the great advantages of ease of application, of not requiring close observation, and of freedom from unpleasant or serious consequences. In no instance was any untoward effect seen to follow the

inoculation or any excessive reaction. With the two scarifications for control there was little difficulty in recognizing a positive reaction.

The Puncture Reaction.—When tuberculin is injected to secure the fever reaction in doses ranging from $\frac{1}{10}$ milligram to 5 milligrams, no local reaction is observed if the injections are made deep into the muscles. If, however, they are made subcutaneously, a local reaction is regularly seen in cases in which a positive fever reaction occurred. This phenomenon, first observed by Epstein, and afterward by Schick, is known as the "stich-reaction." In 38 cases tuberculin was injected subcutaneously for the purpose of obtaining this puncture reaction. The usual dose employed for this purpose was $\frac{1}{100}$ milligram. These patients were all submitted previously or subsequently to von Pirquet's skin test. The skin reaction corresponded in every instance with the puncture reaction, hence it seems unnecessary to tabulate the cases separately. In the dose mentioned the puncture reaction was not so marked as when a larger dose—$\frac{1}{2}$ or 1 milligram—was used. The conclusion drawn from this limited experience was that the puncture test possessed no advantages over the scarification test, and that it was somewhat more troublesome of application.

Fever Reaction to Tuberculin Injections.—This is quite as reliable in young children as in older patients. The fever test is limited in its application, since most cases of active tuberculosis at this period of life are accompanied by fever. Furthermore, young children have slight rises of temperature from so many causes that, unless the reaction is decided and typical in its course, the result may be doubtful. I have not considered a reaction definite unless the temperature has reached at least 102° F. It is necessary that the temperature be taken at four-hour intervals before the injection is given, and after the injection, at two-hour intervals. Accurate dosage is a matter of much importance. Very small doses are unreliable, and too large doses may be fraught with some risk. After considerable experimenting I have settled upon the dose of $\frac{1}{2}$ milligram for infants under six months, and of 1 milligram for those who are older.

Injections of tuberculin in patients suspected to be tuberculous were employed 130 times. For the most part, the injections were made deeply into the muscles, and no local reactions were observed. The temperature usually began to rise in from six to twelve hours, reaching its maximum in from four to eight hours. The average maximum reaction was 103.3° F., which was reached, on the average, in thirteen hours. The temperature remained near the highest point for from six to eight hours, and then fell rather rapidly to the normal. As a rule, the larger the dose given, the more rapid the reaction and the higher the temperature. In no case were any serious symptoms observed to follow the injection, although in several instances high temperatures were accompanied by discomfort, restlessness,

and other symptoms indicating a constitutional disturbance of some severity. In no instance was it apparent that the injection had resulted in the lighting up of a latent tuberculous process. In a few instances a general erythema was noticed, such as follows the injection of diphtheria antitoxin.

The results of the injections in the various pathological conditions are shown in the following table:

RESULTS OF 130 TUBERCULIN INJECTIONS.

Pathological Condition.		Positive Reactions.	Negative Reactions.	Doubtful Reactions.
Positive tuberculosis (sputum, autopsy, operation, or C. S. fluid)	28	22	2 (in one patient apparently cured).	4
Probable tuberculosis (evidence: other tests, history, or physical signs)	21	18	3	..
Probably *not* tuberculosis	80	1	78	1
Positively *not* tuberculosis (autopsy)	1	1	..	..
Totals	130	42	83	5

On the whole, the results obtained by the different tests corresponded with one another and with the pathological condition as determined by other means, the only notable exception being that dying children or those who were extremely sick did not, as a rule, react to any of the tests. An attempt has been made to compare the reliability of the different tests by grouping the exceptional reactions observed in 16 cases in the next table. The numbers, however, are too small to admit of any very definite conclusions.

It will be seen that some failures and some unexplained reactions occurred with all the tests. The results with any test cannot, therefore, be regarded as conclusive, although a positive reaction creates a very strong probability that tuberculosis is present. This is increased if the result is confirmed by other tests.

So far as reliability is concerned, there is not much choice between the skin and the eye test. The skin reaction is, I think, more characteristic and less likely to be doubtful than are some of the eye reactions. Some instances of doubt must occur in the temperature reactions on account of the liability of small children to slight rises of temperature from minor digestive disturbances or other causes.

In ease of application there is a decided advantage in the skin test. The scarification is a trifling matter. The patient does not require continuous observation before or after, and the reaction lasts for a considerable time. The ophthalmic cases need closer watching, the reaction is shorter, and may

EXCEPTIONAL REACTIONS IN 16 CASES.

(— = Negative Reaction; + = Positive; ? = Doubtful.)

I. Positive Tuberculosis with Negative or Contradictory Reactions.

Case.	Age.	History and Clinical Diagnosis.	Eye.	Skin.	Puncture.	Fever.	Remarks.
1.	20 mos.	Bronchopneumonia; bacilli in sputum.	—1% —1%	—	..	..	First eye test in January; skin and second eye test in May shortly before death.
2.	6 mos.	Chronic costo-sternal abscess; bacilli in discharge.	..	..	..	—$\frac{1}{10}$ mgr. (twice). —1 mgr. —1 mgr. (102° in 13 hrs.). ? 3 mgr. (103° in 24 hrs.).	Had croup at time last test was made. Died of diphtheria five months later. Abscess never healed.
3.	4 yrs.	Tuberculous glands. Operation.	—½%	+	..	..	Skin test one month later than eye.

II. Probable Tuberculosis with Negative or Contradictory Reactions.

4.	3 yrs.	Bronchopneumonia. Empyema. Recovery. Father tuberculous.	—½% —1%	+	+	..	Apparently well five months after attack.
5.	3 yrs.	Unresolved bronchopneumonia.	+1%	+	+	—to 1 mgr.	Three months later child doing well.
6.	14 mos.	Bronchitis. Large abdomen. Tuberculous peritonitis?	..	..	+	—to $\frac{1}{10}$ mgr. +to 1 mgr. (104.4° in 13 hrs.).	Following second injection a local reaction occurred at site of first one, made ten days before. Lost sight of.
7	4 yrs.	Chronic bronchitis. Signs cleared up.	+½% Feb.	+ Feb. (twice). — July.	+ June.	+ Feb. (three times). + June.	Following tuberculin injection in June, typical reaction in eye in which tuberculin was used four months before.
8.	4 yrs.	Anemia. Malnutrition. No pulmonary signs. (Sister died of tuberculous meningitis.)	..	+	..	— to 1 mgr.	Lost sight of.

Exceptional Reactions in 16 Cases.—(*Continued.*)

(— = Negative Reaction; + = Positive; ? = Doubtful.)

III Probably Not or with no Other Evidence of Tuberculosis, but with Positive or Contradictory Reactions.

Case.	Age.	History and Clinical Diagnosis.	Eye.	Skin.	Puncture.	Fever.	Remarks.
9.	10 mos.	Pyemic abscesses.	+½% —1%	—	..	..	Fat well nourished child.
10.	9 mos.	Bronchitis. Recovery. Well nourished child.	+½% (Apr.)	—April. —July.	..	+½ mgr. (102.4° in 14 hrs.).	Child well three months after test.
11	9 mos.	Unresolved bronchopneumonia.	—½%	—(twice).	..	+ ½ mgr. (104° in 8 hrs.).	Lost sight of.
12.	22 mos.	Bronchopneumonia sequel measles. General condition bad. Sputum negative.	+½%	—	..	..	Died. No autopsy.
13.	3 yrs.	Chronic bronchitis. No family history.	..	+	..	— to 1 mgr.	Poorly nourished child but running about. Reported well five months later.
14.	..	Malnutrition and gastro-enteritis. Family history negative.	..	+(twice).	..	— to 1 mgr.	Now in hospital. No pulmonary signs two weeks later.

IV. Positively Not Tuberculosis with Positive or Contradictory Reactions.

15.	7 mos.	Bronchopneumonia. Autopsy.	+½%	..	..	..	Many sputum examinations. All negative. In good condition at time of test.
16.	17 mos.	Bronchopneumonia. Autopsy.	..	..	..	— to $\frac{1}{10}$ mgr. — to 1 mgr. + to 5 mgr. (102° in 21 hrs.).	Condition good at first two tests; bad at last test.

be overlooked. It cannot well be used in ambulatory patients. The puncture test is slightly more of an operation and may be objected to. The fever reaction is admissible only when the child can be kept under very close observation.

Objectionable features are wanting in the skin test. There is no local discomfort, no general reaction, and I have seen no complications. With proper precautions I believe the eye test to be quite safe, although an intense or prolonged reaction sometimes occurs which is somewhat alarming; besides, in pathological conditions of the eye, diastrous results may follow. Moreover, the eye is too delicate and important an organ to be used for a test when any other organ will answer quite as well. For general use, the skin test is to be preferred.

With the temperature reaction we may get, accompanying the fever, constitutional symptoms that are quite disagreeable. There exists a possibility that a latent process may be lighted up. Mistakes in dosage, which have been made, may be followed by serious consequences. These risks are added objections to the use of this test. It is certainly an advantage to have several tests, both for purposes of confirmation and to use one where another is not applicable. For all tests one must be sure as to the purity, strength, and freshness of the tuberculin used.

All these tests have been too recently introduced for the final word to be spoken regarding them. No test is absolutely conclusive, as is the demonstration of the tubercle bacillus in the sputum, cerebrospinal fluid, or elsewhere, and one should not fall into the error of depending upon the local tests to the neglect of other means of diagnosis, even though the search for the tubercle bacillus involves greater labor. In general, while the tests furnish strong probability of the existence of a tuberculous lesion, they do not enable us to distinguish between a latent and an active condition. This may at times be confusing. A child may give a positive skin or eye reaction when suffering from an acute pulmonary disease which, by its course, is shown to be non-tuberculous, although grave suspicion of acute pulmonary tuberculosis may have existed and apparently be confirmed by the tuberculin tests. Much needless alarm may, therefore, be produced by a positive reaction, which really indicates only that a tuberculous focus exists somewhere, but does not prove that the present disease from which the child is suffering is of a tuberculous nature. While of the greatest assistance in diagnosis, the various tests are always to be taken in connection with the general symptoms and the physical signs. Taken apart from them, however, they may be very misleading.

THE FREQUENCY OF TUBERCULOSIS IN CHILDHOOD.

By C. von Pirquet,
Vienna.

During the last year and a half I have made a cutaneous test on all the children who were admitted to the children's clinic of Professor Escherich in Vienna. Nearly half of these children were repeatedly examined, and, in very many instances, the results were controlled by subcutaneous injections of tuberculin—made by Dr. Hamburger. Two hundred cases were examined post mortem.

In the first year the reaction occurs in but 5 per cent. of the cases, rapidly increases in the following years, and reaches a percentage of 80 in the tenth year. This high percentage cannot be considered as the figure for all children, because many cases are admitted into the hospitals on account of tuberculosis. In the first year of life nearly all reacting cases present clinical symptoms of the disease. In the succeeding year the number of positive reactions far exceeds the number of negatives. This proves that not all infected cases present clinical symptoms. In other words, that latent tuberculosis becomes more frequent in succeeding years.

This increase of latent tuberculosis is more clearly shown in another study. The children were chiefly those who came to the hospital for some acute infection, and the healthy babies who are brought for observation, and in order that the mothers may be taught how to care for them. This group should give some idea as to the average incidence of latent tuberculosis among the healthy children of Vienna. In the first two years no reactions appear. This shows that during that time an infection with tuberculosis practically does not occur without the existence of some clinical phenomena, such as bronchitis or anemia. On the other hand, the increase in the number of reacting children in the following years is nearly as high as in the first group, and reaches 70 per cent. in the tenth year.

In cases presenting clinical evidence of tuberculosis the reaction is positive in almost all cases after twenty-four hours, whereas in latent tuberculosis, especially in older children, we see about half of the cases react only after some days (this I have termed a "torpid reaction"); and some react only to a second test ("secondary reaction"). Some cases in which the

cutaneous test was negative afterward reacted to the hypodermic injection of tuberculin. These three kinds of reactions have this in common—that a slight reactivity against tuberculin exists, which is too weak to be evidenced immediately, but which is aroused after the first application.

What does this form of reaction mean? One can say that it generally means a slight and old tuberculous infection which is in the process of healing. Up to the present time I have not had a sufficient number of post-mortem examinations to prove this point absolutely. But the following reasons speak for the validity of this view: First, the autopsies in which secondary or torpid reactions were found to have been produced by slight and old tubercles; second, fresh and clinically manifest tuberculosis does not show this form of reaction; third, the increase of these secondary reactions from year to year corresponds in its percentage to that established by Dr. Hamburger for the frequency of healed tubercles found at autopsy in children who died from other causes; and fourth, we have a similar delay in the development of the local phenomena in revaccination with cow-pox in cases in which a long time has elapsed after the previous vaccination.

I conceive that the reactivity against tuberculin appears some weeks after the infection has occurred, and then increases in degree, after some months, rising to a considerable height. If the tuberculosis is overcome by the individual, and is healed, the reactivity slowly decreases in the following years below the level of cutaneous activity. We know, from the studies of various antibodies, that in an organism which has once formed antibodies and has lost them, a slight reinfection or a second injection with the same poison quickly stimulates a new and strong formation of antibodies. In a similar fashion, if a person with a latent or healed tuberculosis is again infected with tubercle bacilli or if he absorbs even a minimal amount of tuberculous poison (by means, for instance, of a cutaneous tuberculin test) he again forms antibodies, and shows some days or a week later a high reactivity. A high reactivity does not prove the existence of an active tuberculous process, in the sense that the tuberculosis is progressive. It only proves that the organism has recently come in contact with tubercle bacilli or their poisons.

Therefore, we can conclude that in older children the tuberculin reactivity may be present in apparently perfect health. This coincides with the facts established by Naegeli, F. Hamburger and others, based on autopsies made in children of various ages.

The percentage of infected (reacting) children is a particularly high one in my studies. In other cities it will hardly be as high because tuberculosis is notoriously prevalent in Vienna. Furthermore, all of my patients belonged to the poorer classes. My statistics, therefore, lose in some degree their general value. Our children are infected at a much earlier age on

account of the prevalence of tuberculosis among their parents. It is necessary to make similar studies in every city in order to ascertain the frequency of tuberculosis in general.

I should, therefore, like to suggest a definite method for international use. The method is as follows:

All children should be submitted to the cutaneous test. The following day they are inspected. Those showing a positive reaction are noted as belonging in the group of early reactions. A week later those showing no reaction are again tested and inspected a day later. If they then react, they are grouped in the class of secondary reactions. Those who have not reacted on either occasion can be considered as belonging to the non-reacting class. This method of testing requires about one hour for a hundred children, and only half an hour is consumed in the inspecting process. Medical school officers could easily accomplish this at the opening of the schools in autumn. One forenoon would be sufficient for a school of from four hundred to six hundred children. As the test is absolutely harmless, there can be no objection to carrying out such valuable investigations.

The classification given above is not perfect, inasmuch as the class of non-reacting children will contain some individuals who, at a further repetition of the test, would react and therefore would have to be transferred from the third to the second class. Three or more trials for three or more consecutive weeks can be easily performed in hospitals. One can also employ the more rapid method of Dr. Hamburger, which consists in injecting one milligram of tuberculin subcutaneously into the non-reacting children and examining them on the following day for a local *subcutaneous* reaction (so-called Stichreaction). This method is, on the whole, quicker and more exact, but is not as feasible for use on a large scale as, for example, in the schools. For practical and especially for statistical purposes the repeated cutaneous test may be considered sufficient.

The next idea in reference to my proposals of an international statistical study is to ascertain at what age children generally acquire the tuberculous affection. We would then be able to say at what age they are most susceptible. I hope that, by repeated annual tests and at the same time determining the clinical symptoms which arise between the last negative and the first positive reaction, we may be able to establish the onset of the disease. In this way we will be in a position to institute the proper hygienic measures for the prevention of tuberculous infection in childhood, especially at the period of greatest danger.

Age Last Birthday.	Number Reported On.			Total.
	33	37	43	113
1 year	..	2	1	3
2 years	1	1	1	3
3 years	..	2	2	4
4 years	1	1	4	6
5 years	2	6	3	11
6 years	4	2	4	10
7 years	4	2	4	10
8 years	3	3	3	9
9 years	2	1	2	5
10 years	4	1	3	8
11 years	2	2	7	11
12 years	4	1	1	6
13 years	2	4	2	8
14 years	..	4	2	6
15 years	1	1	..	2
16 years	1	1	3	5
17 years	1	..	..	1
18 years	..	..	..	..
19 years	1	2	1	4
20 years	..	1	..	1

Number of Living-rooms	Number Reported On.			Total.
	32	9	16	57
One	..	..	1	1
Two	6	..	..	6
Three	17	5	5	27
Four	5	2	8	15
Five	4	2	2	8
Six	..	..	..	0
Seven	..	..	..	0

Number of Children Living.	Number Reported On.			Total.
	32	13	15	60
One	4	..	1	5
Two	3	3	3	9
Three	10	..	6	16
Four	4	5	..	9
Five	6	5	..	11
Six	5	..	5	10
Seven	..	..	..	0

Number of Children Dead.	Number Reported On.			Total.
	32	13	15	60
One	3	1	5	9
Two	8	4	..	12
Three	2	..	1	3
Four	..	..	2	2
Five	2	..	..	2
Six	..	..	1	1
Seven	5	..	..	5
None	12	8	6	26

Number of Adults in Family.	Number Reported On.			Total.
	17	8	5	30
One	3	1	..	4
Two	13	7	3	23
Three	..	..	2	2
Four	1	..	..	1

Quality of Food.	Number Reported On.			Total.
	33	12	14	59
Good	15	5	7	27
Bad	18	7	7	32

Service and Cooking.	Number Reported On			Total.
	33	12	14	59
Good	21	7	7	35
Bad	12	5	7	24

Member of Family Sick.	Number Families Reported On.			Total.
	16	21	20	56
Father and Mother	3	..	..	3
Father	10	15	14	38
Mother	2	6	3	11
Aunt	1	..	..	1
Uncle	..	..	1	1
Grandfather	..	..	1	1
Grandmother	..	..	..	0
Brother	..	..	1	1
Sister	..	..	1	1
Uncle and Aunt	1	(Adopted Child)	(2 in 1 Family)	1

Physical Condition of Patient.	Number Reported On.			Total
	19	8	9	36
Dead	1	3	1	5
In Bed	3	3	3	9
At Work	15	2	5	22

Expectoration.	Number Reported On.			Total.
	15	6	6	27
Profuse	10	4	3	17
Scant	5	2	3	10

Height.	Number Reported On.			Total.
	..	..	..	..
Above Standard (Amer.)	..	..	..	..
Normal	..	..	..	..
Below Standard	..	..	..	..

Weight (American.)	Number Reported On.			Total.
	..	..	..	..
Above Standard	..	..	..	..
Normal	..	..	..	..
Below Standard	..	..	..	..

Nutrition.	Number Reported On.			Total.
	33	12	11	56
Good	22	7	7	36
Bad	11	5	4	20

Glands.	Number Reported On.			Total.
	33	26	24	83
Enlarged Anterior Cervical Glands	28	20	18	66

Posture.	Number Reported On.			Total.
	33	26	25	84
Good	20	16	19	55
Bad	13	10	6	29

Conformation of Chest.	Number Reported On.			Total.
	33	26	24	83
Good	24	17	18	59
Bad	9	9	6	24

Conformation of Ribs.	Number Reported On.			Total.
	33	26	24	83
Good	25	18	18	61
Bad	8	8	6	22

Position of Scapulæ.	Number Reported On.			Total.
	33	26	25	84
Good	22	17	19	58
Bad	11	9	6	26

Teeth (Decayed, premature loss, deformed arches).	Number Reported On.			Total.
	32	9	13	54
Good	3	5	3	11
Bad	29	4	10	43

Oral Hygiene (Including daily toilet of mouth—condition of gums).	Number Reported On.			Total.
	32	9	13	54
Good	1	4	1	6
Bad	31	5	12	48

Abnormal Pulmonary Condition.	Number Reported On.			Total.
	33	23	35	91
	3	1	10	14

Tonsils.	Number Reported On.			Total.
	33	31	37	101
Number Hypertrophied—including any tonsil with enlarged follicles protruding or submerged	26	25	32	83

Adenoids.	Number Reported On.			Total.
	33	31	37	101
Number Present	32	27	37	96

Defective Nasal Breathing.	Number Reported On.			Total.
	33	29	35	97
Number Obstructed	33	25	35	93

Number of Calmette Tests Applied.	Number Reported On.			Total.
	30	7	6	43
Number Positive.....	16	3	2	21
	(Degrees of reaction stated in reports on each individual.)			

Operations Performed.	Number Reported On.			Total.
	33	31	37	101
Includes tonsillotomy, adenoidectomy, turbinectomy.	5	5	3	13

Fréquence de la Tuberculose chez les Enfants.—(von Pirquet.)

Comme résultat de 1400 examens avec l'épreuve cutanée à la tuberculine à la clinique de Escherich on a préparé une table qui montre que l'infection par la tuberculose augmente d'année en année. Ces résultats ont été comparés avec les statistiques compilées des autopsies pratiquées sur les enfants.

L'auteur discute la signification des différentes sortes de réactions qui apparaissent dans les premières années et dans les années plus avancées de l'enfance.

Je propose de compiler des statistiques internationales qui devront être préparées de la manière suivante:

Les enfants de tous âges, par exemple les enfants des Kindergartens et des écoles, devront être soumis à l'épreuve cutanée le premier jour; le jour suivant tous devraient être inspectés. Ceux qui montrent une réaction devraient être classés comme appartenant à la classe des 'réactions précoces,' ce qui signifie pratiquement qu'ils ont eu l'infection récemment. Une semaine plus tard il faudrait soumettre de nouveau à l'épreuve les enfants qui n'ont montré aucune réaction à la première épreuve. Une grande proportion des enfants plus âgés réagiront maintenant: ils appartiennent à la classe des 'reaction secondaire,' ce qui signifie généralement qu'ils ont eu l'infection dans les années précédentes. Les enfants qui n'ont réagi dans aucune des deux occasions précitées appartiennent à la troisième classe, que l'on peut considérer comme comprenant ceux qui sont pratiquement indemnes de la tuberculose.

Pour obtenir une certitude de l'indemnité de cette troisième classe, on

peut injecter, le jour suivant, les enfants qui ne réagissent pas, avec 1 mg. de tuberculine, suivant la proposition de F. Hamburger, et inspecter ces enfants le jour suivant pour observer la réaction sous-cutanée locale. Cette épreuve évidemment ne serait possible que dans les hôpitaux, tandis que dans les écoles il faut se contenter des épreuves cutanées, qui peuvent se faire sans inconvénient pour les enfants.

De cette manière on pourrait noter dans les différentes villes la proportion d'infection pour cent et les âges auxquels cette infection survient et on pourrait par conséquent tirer des conclusions pour l'hygiène.

Die Häufigkeit der Tuberkulose im Kindesalter.—(VON PIRQUET.)

Als das Resultat von 1400 Prüfungen mit der kutanen Tuberkulinprobe in Escherich's Klinik wurde eine Tabelle bereitet, welche die Vermehrung der Infektion der Tuberkulose von Jahr zu Jahr zeigt. Diese Resultate wurden mit der Statistik verglichen, die von den Sektionsberichten der Kinder gemacht sind.

Die Bedeutung der verschiedenen Arten von Reaktionen, welche im frühen und späten Kindesalter erscheinen, wird erörtert. Ich schlage vor, dass eine Internationale Statistik in der folgenden Weise gemacht wird:

Dass Kinder in allen Altersstufen vom Kindergarten bis zur allgemeinen Schule mit der kutanen Probe am ersten Tage geprüft werden; am folgenden Tage sollten sie alle untersucht werden. Diejenigen, welche eine Reaktion zeigen, sollte man als zur Klasse "Frühreaktion" bezeichnen, was eigentlich eine neuliche Infektion bedeutet. Eine Woche später werden diejenigen Kinder, welche auf den ersten Versuch nicht reagierten, wieder der Probe unterworfen. Ein grosser Prozentsatz von älteren Kindern wird nun reagieren, und sie gehören zu der Klasse "Secundärreaktion" was gewöhnlich eine Infektion in früheren Jahren bedeutet. Diejenigen Kinder, die auf keine der beiden Prüfungen reagiert haben, gehören zur dritten Klasse, welche als tatsächlich frei von Tuberkulose betrachtet werden kann.

Um Gewissheit auf Bezug auf die dritte Klasse zu erlangen, könnte man den nichtreagierenden Kindern am folgenden Tage ein Milligramm Tuberculin nach dem Vorschlage von F. Hamburger einspritzen, und am nächsten Tage sollte man sie untersuchen in Bezug auf die lokale subkutane Reaktion. Diese Prüfung natürlich ist nur in einem Spitale möglich; während man in den Schulen sich mit den kutanen Prüfungen zufrieden geben muss, die ohne alle Unbequemlichkeit für die Kinder gemacht werden kann.

In dieser Weise könnte man Notiz nehmen in den verschiedenen Städten

von dem Prozentsatz der Infektion und von den Alter, in welchem solche Infektionen vorkommen, und man könnte für die Hygiene Schlussfolgerungen ziehen.

Dr. Laislaw Detre, of Budapest made an address on the

DIFFERENTIAL CUTANEOUS REACTION,

and demonstrated his diagnostic method by presenting a group of children previously inoculated at the Children's Hospital, Washington.

(See Joint-Session of Sections I and II.)

CLINICAL OBSERVATIONS ON THE VON PIRQUET REACTION IN CHILDREN.

By Henry Heiman, M.D.,
From the Children's Service of Mt. Sinai Hospital, New York City.

In the determination of the existence of systemic infection with the tubercle bacillus during the periods of infancy and childhood, we are often deprived of the two most important diagnostic aids in this field of medicine, namely, the bacteriological examination of the sputum and the subcutaneous injection of tuberculin. The absence of expectoration in childhood deprives us of the former, whereas the instability of the body temperature and the not infrequently severe constitutional reaction following tuberculin injection render the latter method unreliable and unsafe.

The recent announcement, by von Pirquet, of a diagnostic reaction based on the most advanced studies in immunity and anaphylaxis, which is particularly applicable to the period of infancy, has, therefore, aroused universal interest, and has led to the production of an extensive literature containing the records of many series of clinical and pathological observations.

The present investigation was undertaken in the Children's Ward of Mt. Sinai Hospital, in the service of Dr. Koplik. The technic was essentially that described by von Pirquet. The extensor surface of the arm or forearm was the usual site of inoculation. By means of a needle or a specially devised borer, three small circular abrasions, from $\frac{1}{2}$ to an inch apart, were made. To the middle one a drop of the properly diluted tuberculin solution was applied, while to the other two (control points) a drop of 5 per cent. solution of carboglycerin was similarly applied. In the cases giving a positive reaction a small papule surrounded by a circular areola developed within from twelve to twenty-four hours. The control points showed a slight inflammatory reaction of only a few hours' duration. The papular stage was of variable duration. In none of the cases was the reaction accompanied by severe inflammatory symptoms. Swelling of the axillary lymph-nodes was not noticed. The body temperature did not rise subsequent to the application, and the leukocyte count remained unchanged.

In most of the earlier cases a 25 per cent. solution of Koch's old tuberculin (obtained from the Alexander Laboratories at Marietta, Pa.) was employed.

Recently, in order to determine the relative delicacy of various strengths of tuberculin solutions, I have employed a 10, 25, and 100 per cent. solution of tuberculin simultaneously. With but few exceptions the 10 per cent. yielded a negative result, whereas the 100 per cent. gave the same results as the 25 per cent. tuberculin solution.

TABLE SHOWING THE RESULTS OF THE VON PIRQUET TEST IN 104 CHILDREN AGED FROM 4 MONTHS TO 13 YEARS.

Clinical Diagnosis.	Character of Reaction. Positive.	Negative.
Adenitis, tuberculous	3	..
Amblyopia, congenital	..	1
Arthritis, chronic	..	1
Arthritis, syphilitic	..	2
Autointoxication, intestinal	1	2
Bronchitis, chronic	..	4
Bronchopneumonia	1	4
Chorea	..	1
Empyema	..	4
Endocarditis, chronic	1	3
Endocarditis, ulcerative	..	1
Enterocolitis	..	2
Enteritis	1	8
Gangrene, pulmonary	..	1
Glioma, retinal	1	..
Heart, congenital	..	1
Hydrocephalus, internal	..	1
Idiocy, amaurotic family	1	1
Idiocy, congenital	..	1
Influenza	..	1
Laryngitis, acute	1	..
Malaria, tertia	..	2
Marasmus	..	1
Meningitis, cerebrospinal	..	1
Meningitis, tuberculous	2	12
Nephritis, acute	..	1
Pleurisy, dry	..	1
Pleurisy with effusion	4	2
Pneumonia, lobar	..	4
Peritonitis, tubercular	2	1
Pseudoleukemia (v. Jaksch)	..	2
Pyelitis	..	1
Rachitis	1	..
Sarcoma, renal	1	..
Syphilis, congenital	..	2
Tubercle, solitary	1	..
Tumor, cerebellar	1	1
Tuberculosis, pulmonary	2	..
Tuberculosis, miliary	1	..
Typhoid	1	8
Total	26	78

The tuberculin vaccination was performed on 104 children, the ages ranging from four months to thirteen years; 26 children showed a positive reaction and 78 a negative one. The cases giving a positive reaction included the following: 3 cases of tuberculous adenitis; 2 cases of tuberculous meningitis; 2 cases of pulmonary tuberculosis; 2 cases of tuberculous peritonitis;

1 case of solitary tubercle of the brain; 1 case of miliary tuberculosis; 4 cases of pleurisy with effusion, and 1 case each of bronchopneumonia, glioma of the retina, amaurotic family idiocy, rickets, intestinal intoxication, sarcoma of the kidney, typhoid, subacute endocarditis, acute laryngitis, acute endocarditis, and cerebellar tumor.

In all but three cases the diagnosis was based on clinical observations and on laboratory investigations alone. One case of miliary tuberculosis and one of amaurotic family idiocy came to autopsy. In the former, extensive miliary tuberculosis of the lungs, liver, and spleen was found, whereas in the latter—the case of amaurotic family idiocy—the macroscopical appearance of the organs did not show any signs of tuberculosis. The microscopical changes in the organs are still under investigation in the pathological laboratory of the hospital. In one case of tuberculous adenitis an excised portion of an ulcer of the mouth showed the typical microscopical appearances of tuberculosis.

In none of the cases of pleurisy with effusion could the tubercle bacilli be demonstrated in the pleural fluid. In one case, however, a cytological examination gave 95 per cent. mononuclear leukocytes.

One rachitic infant gave a marked cutaneous reaction. The infant's mother had recently died of pulmonary tuberculosis, but there was no clinical evidence to show that the infant itself was suffering from a tuberculous infection. This case brings up the interesting question of the possibility of transmission from the parents of the specific bodies on which the cutaneous reaction is supposedly dependent.

The 78 cases which gave a negative reaction included, as will readily be seen from the table, a variety of morbid conditions. I must draw special attention to the group of tuberculous meningitis—12 out of 14 were negative. The clinical diagnosis was made by the history, clinical course, and the character of the fluid obtained by lumbar puncture. In 4 of these cases tubercle bacilli were found in the cerebrospinal fluid. The cutaneous application was performed within three to ten days of the time of death. In one case a 100 per cent. tuberculin solution was applied twice, with negative results. This patient was also subsequently injected four times with 0.001, 0.0015, 0.002, and 0.0025 respectively, with negative results. The frequency of negative reactions in this class of cases, where the systemic infection is either very intense or at an advanced stage, has been noted by a number of observers. An apparently plausible explanation of this fact has been offered by von Pirquet and others.

As the cutaneous reaction is supposed to be dependent on the presence of specific antibodies, bacteriolysins, or ferments, it may readily be conceived that where the infection is very severe or in an advanced stage, a diminished production, or even a total cessation of production, of these

bodies may take place. This conception of the nature of the reaction gives the basis for the supposed prognostic value of the test. A negative reaction in a case of known tuberculous infection is thus of ominous import.

In the remaining 66 cases there was no reason to suspect the existence of tuberculosis. I desire to call special attention to the cases of typhoid fever in this series (9). Several European observers have reported the frequent occurrence of a positive reaction in this infectious disease. In only one of our typhoid patients was the reaction positive, but as the case did not come to autopsy, the existence of tuberculosis could not be positively excluded; however, clinically no evidence of tuberculosis was present.

The result of the present investigation shows the limitations of this test in two directions, and is in correspondence with the results of other observers in this field. The method apparently fails us in the advanced cases of tuberculosis; a fact which, as has been said before, may prove to be of great prognostic importance. The limitation of the method in the other direction, namely, in its being positive in apparently non-tuberculous conditions, is a much more serious drawback. Eleven of the 104 cases must be placed in this category. The existence of latent tuberculosis in these cases cannot, however, be excluded. It is to be hoped that, perhaps, by the proper dilution of the tuberculin or some other modification of the method of application, we will obtain a reaction in cases of active tuberculosis only, and thus greatly enhance the diagnostic value of this test.

Algunas Observaciones Clínicas Sobre la Reacción de von Pirquet en los Niños.—(HEIMAN.)

Cincuenta y siete niños fueron vaccinados por el método de V. Pirquet en el Hospital Monte Sinai, en el servicio de los niños del Dr. Koplik y del autor, de los cuales veinte dieron una reacción positiva y en treinta y siete la reacción fue negativa.

Entre los veinte niños, en los cuales la reaccion fue positiva, las condiciones mórbidas fueron las siguientes: Tuberculosis de las glandulas linfáticas, 3 casos; meningitis tuberculosa, 2; peritonitis tuberculosa, 2; tuberculosis del cerebro, 1; tuberculosis pulmonar (probable), 2; pleuresía con efusión, 4; bronco-neumonía, 1; glioma de la retina y dactilitis multiplice, 1; idiotismo amaurótico hereditario, 1; raquitis, 1; intoxicación intestinal, 1; y sarcoma del riñon, 1.

Los treinta y seite casos negativos incluyen las enfermedades siguientes; Ambliopia congenital, 1; artritis crónica, 1; artritis sifilítica, 2; autointoxicación intestinal, 1; bronquitis crónica, 3; bronco-neumonía, 3; enterocolitis, 2; empiema, 3; gangrena pulmonar, 1; idiotismo hereditario y

amaurosis, 1; idiotismo congenital, 1; marasmo, 1; meningitis tuberculosa, 8; nefritis aguda, 1; pleuresía con efusión, 1; pleuresía seca, 1; neumonía lobular, 1; seudo-leuquemia (v. Jaksch), 1; pielitis, 1; sífiles, 1; tumor del cerebelo, 1; tifoidea, 1.

El autor hace especial mención de los casos de meningitis tuberculosa en los cuales un ochenta por ciento (8 en 10), dieron una reacción negativa. Probablemente esto es debido al hecho de que la vaccinación fue hecha durante el ultimo período de la enfermedad, en el cual la ausencia de bacteriolisinas impidió la reacción positiva.

Quelques observations cliniques sur la réaction de v. Pirquet chez les enfants.—(HEIMAN.)

Cinquante-sept enfants ont été vaccinés, d'après la méthode de v. Pirquet, à l'hôpital Mt. Sinaï, dans le service des maladies des enfants de Drs. Koplik et Heiman. La réaction fut positive dans 20 cas et négative dans 37.

Les 20 enfants qui ont montré une réaction positive étaient atteints des maladies suivantes: Adénite tuberculeuse, dans 3 cas; méningite tuberculeuse, 2; péritonite tuberculeuse, 2; tubercule solitaire du cerveau, 1; tuberculose pulmonaire (probable), 2; pleurésie avec effusion, 4; broncho-pneumonie, 1; gliome de la rétine et dactylite multiple 1; idiotisme amaurotique (familial), 1; rachitisme, 1; intoxication intestinale, 1; et sarcome du rein, 1.

Les 37 cas négatifs présentaient les affections suivantes: Amblyopie congénitale, 1; arthrite chronique, 1; arthrite syphilitique, 2; auto-intoxication intestinale, 1; bronchite chronique, 3; broncho-pneumonie, 3; entéro-colite, 2; empyème, 3; gangrène pulmonaire, 1; idiotisme amaurotique (familial), 1; idiotisme congénital, 1; marasme, 1; méningite tuberculeuse, 8; néphrite aiguë, 1; pleurésie avec effusion, 1; pleurésie sèche, 1; pneumonie lobaire, 1; pseudo-leucocythémie (v. Jaksch), 1; pyélite, 1; syphilis, 1; tumeur du cérebellum, 1, et fièvre typhoïde, 1.

Nous devons attirer l'attention spéciale sur les cas de méningite tuberculeuse. 80% (8 sur 10) montrèrent une réaction négative, ce qui est probablement dû à ce que la vaccination fut faite vers la fin de la maladie, lorsque l'absence d'anti-corps ou de bactériolysines ne permettait pas de réaction positive.

Einige klinische Beobachtungen bei der v. Pirquet'schen Reaction bei Kindern.—(HEIMAN.)

Siebenundfünfzig Kinder waren nach der v. Pirquet'schen Methode im Mount Sinai Hospitale in Dr. Koplik's und meiner Kinderabteilung geimpft worden: 20 Kinder zeigten eine positive und 20 eine negative Reaction.

Die 20 Kinder, die eine positive Reaction ergaben, litten an folgenden krankhaften Zuständen: Tuberkulöse Adenitis, 3 Fälle; tuberkulöse Meningitis, 2; tuberkulöse Peritonitis, 2; Solitärtuberkel des Gehirns, 1; Lungentuberkulose (vielleicht), 2; Pleuritis mit Effusion, 4; Bronchopneumonie, 1; Gliom der Retina und multiple Dactylitis, 1; amaurotische Familienidiotie, 1; Rachitis, 1; intestinale Intoxication, 1; und Sarkom der Nieren, 1.

Die 37 negativen Fälle schlossen die folgenden Krankheiten in sich: Congenitale Amblyopie, 1; chronische Arthritis, 1; syphilitische Arthritis, 2; intestinale Autointoxication, 1; chronische Bronchitis, 3; Bronchopneumonie, 3; Enterocolitis, 2; Empyem, 3; Lungengangrän, 1; amaurotische Familienidiotie, 1; angeborene Idiotie, 1; Marasmus, 1; tuberkulöse Meningitis, 8; acute Nephritis, 1; Pleuritis mit Effusion, 1; trockene Pleuritis, 1; Lobarpneumonie, 1; Pseudoleukämie (v. Jaksch), 1; Pyelitis, 1; Syphilis, 1; Gehirntumor, 1; Typhus, 1.

Besondere Aufmerksamkeit muss den Fällen von tuberkulöser Meningitis zugewendet werden. Achtzig Prozent (acht von unseren zehn) gaben eine negative Reaction. Dies hängt vielleicht von der Thatsache ab, dass die Impfung während des Endstadiums der Krankheit vorgenommen wurde, als die Abwesenheit von Antikörpern oder Bacteriolysinen das Vorkommen einer positiven Reaction verhinderte.

RECENT TESTS IN THE DIAGNOSIS OF TUBERCULOSIS IN CHILDREN AT THE NEW YORK POST-GRADUATE MEDICAL SCHOOL AND HOSPITAL.

By Henry Dwight Chapin, M.D.,
Professor of Diseases of Children, New York Post-Graduate Medical School and Hospital,

and T. Homer Coffin, M.D.,
Instructor in Pathology, New York Post-Graduate Medical School and Hospital.

Since the conjunctival test was recommended, less than a year and a half ago, it is estimated that about 10,000 tests have been reported by various observers. The cutaneous reactions have been studied and reported in probably half this number of cases. These tests have been made upon patients of varying ages, and it has often been found that healthy adults show positive results. On the other hand, infants and children clinically tuberculous react in a significant way, while healthy patients rarely react to the tests. Comparison of results obtained in this large number of patients is difficult; the strength of tuberculin varies widely; the condition of the patient at the time of observation is frequently not stated, and the stage of the disease is not taken into account.

In 125 cases, adults and children, clinically tuberculous and non-tuberculous, the conjunctival test has been applied in this hospital.

Seventy cases were studied in reference to the conjunctival reaction in cases plainly tubercular. The patients were children varying in age from six months to thirteen years. In each case the condition was closely studied until proved to be clearly tuberculous; in eleven the clinical findings were verified at autopsy, and the others by microscopical examinations of sputum, tissues, spinal fluid, etc., wherever obtainable. Thirty-seven were cases of bone tuberculosis, demonstrated by operation. In all the conjunctival tests a uniform preparation of tuberculin was used, carefully measured for each case. The preparation was a 0.5 per cent. solution of the alcoholic extract of Koch's old tuberculin.

The observations so far as the eye test is concerned were undertaken with several objects in view: (1) Specificity of the test; some observers

contend that the test is of no great value in diagnosis as it occurs in non-tuberculous as well as in tuberculous individuals. (2) Does the activity or extent of the lesion bear any relation to the degree of reaction? (3) Is the test of value in prognosis? (4) Is the conjunctival reaction free from danger?

1. *Specificity of the Test.*—In our series all the cases were clearly tuberculous. The majority of them had tubercular bone disease. Some had pulmonary tuberculosis; others had well-marked suppurating glands, removed and examined microscopically; tubercular meningitis, verified at autopsy and by examination of spinal fluid; tubercular peritonitis. In six cases of young children under three years of age, who showed marked malnutrition and were steadily losing ground, the conjunctival test was positive. Clinically there was nothing in these cases upon which to make a positive diagnosis of tuberculosis, but at necropsy caseous bronchial glands were found. In our post mortems upon children we have been impressed with the frequency with which this picture is seen. Children in large cities, living in poor hygienic surroundings, may lose weight rapidly and present the general evidences of progressive malnutrition. In many of them the condition must form what these and similar cases reveal at autopsy. It is fair to believe that cases of this nature have been reported by various observers as not tuberculous, but the conjunctival test reacted to all of this class of cases that were proved by autopsy to be tubercular. Thus in cases reported to give a reaction in apparently non-tubercular patients, this obscure type of tuberculosis may have been present.

2. *The Degree of Reaction;* (3) *Prognosis.*—In young children crying may interfere with the conjunctival test, since the tears wash out the tuberculin. Various degrees of reaction have been recognized from the earliest observations upon this test. Some cases responded quickly and mildly, while others reacted quickly and strongly and persisted for some days. Other reactions were latent, not appearing for several hours or a day after the use of tuberculin. All these facts must now be interpreted as significant. From our observations on actual tuberculosis, we coincide with Wolff-Eisner and others that a promptly appearing severe reaction indicates a favorable prognosis; a delayed mild reaction indicates a healed or latent lesion. The more severe the reaction, the better are the prospects of cure. A quickly appearing mild reaction or failure to react suggests an unfavorable prognosis and a severe and active tuberculous process. Two cases may be noted which illustrate this point. One was an advanced case of pulmonary tuberculosis which, soon after admission, developed tubercular peritonitis. The ocular test failed to react in this case. The second was a well-marked case of tubercular peritonitis. The child showed advanced

emaciation and at the autopsy typical tubercular lesions were found in the peritoneum. This case likewise showed no reaction.

Cases of tubercular meningitis, with clinical evidences of severe infection, uniformly showed no reaction; advanced cases of bone tuberculosis likewise failed to react, while cases of tuberculous glands and other localized tubercular processes gave a positive reaction.

When we consider Wolff-Eisner's theory of the tuberculin reactions, these cases are made clearer of comprehension. In individuals with tubercular lesions there are present in the blood bacteriolysins to the tubercle bacillus. All tuberculins contain at least fragments, splinters of tubercle bacilli; when these come in contact with a patient's bacteriolysins, endotoxins are set free from these fragments and cause the phenomena of the reaction.

4. *Dangers of the Conjunctival Reaction.*—It is claimed by some that lesions of the eye, not tubercular, have been aggravated by the use of the conjunctival test and that general and constitutional symptoms have been produced by the instillations. In our experience ordinary mild conjunctivitis is not a contraindication. In children, cases have been reported of phlyctenular conjunctivitis lighted up by the test. This is considered to be almost always a scrofulous manifestation. These children possess a hypersusceptibility to the poisons of the tubercle bacillus, and only weak solutions should be used if the test is employed at all.

We have seen no injurious effect from the conjunctival test in 125 cases in which it was employed. The worst effect was a mild conjunctivitis lasting from two to three weeks. It is only fair to add, however, that a careful preliminary examination of the eyes was always made to exclude ocular lesions before employing the test.

The Cutaneous Test.—Hamill, Carpenter, and Cope have reported the results obtained in 134 cases in children carefully controlled. The conjunctival, Pirquet, and Morro ointment tests were used; all the patients were under eight years of age. The conjunctival test was sometimes followed by serious inflammations of the eye, with even a possible subsequent loss of vision. In their opinion the skin and ointment test were better than the conjunctival. The ointment test offers the advantage that it does not furnish a portal of entry for secondary infections through abraded surfaces. They consider that all these methods are of less value than was hoped for in the diagnosis of irregular forms of tuberculosis, that a negative reaction is of more value than a positive one, and that the type of the reaction bears no relation to the type of the disease. Our observations do not coincide with the latter view.

Comby, in a paper read before the Société Médicale des Hôpitaux in May, extolled the cutaneous reaction for use in children because of its com-

plete innocuousness, and ascribed its want of popularity to the fact that its method of use had not been laid down definitely. He uses a 1 per cent. solution of tuberculin, which is also employed for the ocular reaction. Instead of scarification, which is painful and to which patients object, he makes three pricks with the vaccine lancet in the deltoid region. On the next day and on the day after, he observes the result. If there is no reaction, only traces of the pricks can be seen—three small black spots without surrounding redness. If the reaction is positive after twenty-four hours, or later, there is more or less intense redness around the pricks. This is followed by papules which last from eight to ten days.

Von Pirquet, on account of the frequency with which apparently healthy adults react to the cutaneous test, has considered its field of usefulness limited largely to the study of tuberculosis in children. Wolff-Eisner considers that the cutaneous test reveals the presence of latent or healed tuberculosis, while the conjunctival test shows the presence of more or less active lesions. The great value of the cutaneous test is as an aid to prognosis; the conjunctival test is a more valuable diagnostic procedure.

In our experience the cutaneous test is not so easily used in children on account of the pain produced by the vaccination. Ten cases, all clinically tubercular, were tested in this manner. The results were approximately those obtained with the conjunctival test. Since the conjunctival test is so readily employed and has been so satisfactory, we prefer it to the former.

The Opsonic Index.—A series of 12 cases of tubercular disease of the hip and spine were carefully observed with reference to the opsonic index in the wards of this hospital. The patients were children varying from three to thirteen years of age. The tuberculo-opsonic index has been shown to be below normal in most cases of localized tuberculosis, though it may fluctuate if the tubercular process is active, and there is autointoxication. In 150 cases of localized tuberculosis Bulloch found that the average index was 0.75, and in 22 cases of tubercular bone and joint disease Potter, Ditman, and Bradley found that the index was below normal in 14, normal in 3 cases, and above normal in 5.

In our observations it was found that in severe tubercular infections the index is often high or may be low, according as the resistance of the patient is good or very poor. By the use of small doses of tuberculin the index can be made to rise, and the condition of the patient improves with this rise. This was noticed in 9 cases. In those cases, however, which have discharging sinuses and secondary infections with other organisms, it was not possible to improve the patient's condition by the use of tuberculin alone. From these observations the following conclusions may be drawn:

1. The opsonic index varies with the severity of the disease and the patient's resisting power.

2. The technic of obtaining the index is so difficult, and when estimated by several careful observers on the same patient, may vary so widely, that it is of little practical value in diagnosis.

3. The index, when obtained by careful technic, may be of value in prognosis, as showing the resistance of the patient to the toxins produced by the tubercle bacillus.

CLINICALLY TUBERCULAR CASES TESTED WITH TUBERCULIN APPLIED TO CONJUNCTIVA.

	Age.	Reaction.	Condition on Discharge.
1. Pott's disease	3	Positive, mild.	Severe infection.
2. Pott's disease	7	Positive, mild.	Severe infection.
3. Pott's disease	13	Positive, marked.	Improved.
4. Tuberculous hip	3½	Positive, marked	Improved.
5. Pott's disease	3	Positive, mild.	Improved.
6. Pott's disease	5	Positive, mild.	Improved.
7. Pott's disease	13	Positive, marked.	Severe infection improved.
8. Pott's disease	3	Positive.	Improved.
9. Pott's disease	4	Test doubtful.	Severe infection.
10. Pott's disease	11	Test doubtful.	Severe infection.
11. Tubercular knee sinus	11	Positive, severe.	Severe infection.
12. Hip disease	7	Positive, mild.	Severe infection.
13. Pott's disease	15	Positive, severe.	Improved.
14. Hip disease	6	Positive, mild.	Slight conj. for three weeks.
15. Tubercular dactylitis	2½	Positive, marked.	Mild infection.
16. Tubercular elbow	..	Positive, marked.	Mild infection.
17. Pott's with abscess	3	Positive, marked.	Improved.
18. Double hip	4	Negative.	Died. Severe infection.
19. Hip disease	3	Negative.	Died.
20. Pott's cervical	3	Positive, mild.	Severe infection.
21. Hip disease	6	Positive, mild.	Severe infection.
22. Hip disease	7	Positive, marked.	Mild infection.
23 Tuberculous ankle	2½	Positive, marked.	Mild infection.
24. Pott't disease	3	Positive, marked.	Mild infection.
25. Pott's disease	9	Positive, marked.	Mild infection.
26. Hip disease	12	Positive, marked.	Mild infection.
27. Pott's disease	7	Positive, marked.	Mild infection.
28. Pott's disease	5	Positive, marked.	Mild infection.
29. Tub. glands of neck	2	Positive, marked.	Improved.
30. Tub. glands of neck	7	Positive, marked.	Improved.
31. Tub. abscess neck	17 months.	Negative.	Severe infection.
32. Tub. bronchopneumonia	4½	Negative.	Died.
33. Tub. foot	6	Positive, marked.	Improved.
34. Fracture tibia, tuberculosis secondary	5	Positive.	Improved.
35. Tub. meningitis	3	Negative.	Died.
36. Tub. sinus, neck	5	Positive, mild.	Improved.
37. Tub. foot, cold abscess shoulder	22 months.	Positive.	Died.
38. Tuberculous ankle	3½	Positive.	Improved.
39. Tub. meningitis	6 months.	Positive.	Died three weeks later.
40. Tub. caries of spine	3	Negative	Severe infection.
41. Tub. shoulder	6	Positive.	Unimproved.
42. Tub. Submaxillary gland	5	Positive.	Improved.
43. Tub. otitis media	4¾	Negative.	Died.
44. Enteritis, marasmus tubercular (?)	2	Negative.	Died.

Clinically Tubercular Cases Tested with Tuberculin Applied to Conjunctiva.—(*Continued.*)

	Age.	Reaction.	Condition on Discharge.
45. Tuberculous elbow ...	5	Positive, marked.	Improved.
46. Tub. meningitis.....	2¼	Negative.	Died.
47. Tub. pulmonalis.....	...	Slight.	Died.
48. Tub. pul. and peritonitis.....	4	Negative.	Unimproved.
49. Tub. sinus hand and face.....	5	Negative.	Died. Severe infection.
50. Tub. dactylitis, double mastoid.....	3	Positive, mild.	Died.
51. Tub. lung and Pott's .	4	Positive, mild.	Unimproved.
52. Tub. pul. and enteritis	22 months.	Negative.	Died. Severe infection.
53. Tub. peritonitis (severe).....	3½	Negative.	Unimproved.
54. Tub. bronchitis.....	20 months.	Positive.	Improved.
55. Empyema, tubercular	11 months.	Negative.	Improved.
56. Cystitis.....	6	Positive.	Improved.
57. Tub. peritonitis.....	16 months.	Negative.	Improved.
58. Tub. meningitis.....	2⅓	Positive, mild.	Died.
59 Tub. glands, neck		Positive, marked.	Improved.
60. Mil. tuberculosis.....	1	Negative.	Died.
61. Tub. peritonitis.....	21 months.	Positive, mild.	Died.
62. Tub. hip.....	3½	Positive.	Improved.
63. Tub. periton. and pulmonary.....	20 months.	Partial.	Died.
64. Adenitis, tubercular ..	3½	Negative.	Cured.
65. Tub. glands, neck (suppurating).....	18 months.	Positive, marked.	Improved.
66. Malnutrition, tuberculous at autopsy	8 months.	Positive, mild.	Died.
67. (Same).....	5½ months.	Positive, mild.	Died.
68. (Same).....	1	Positive, mild.	Died.
69. (Same).....	6 months.	Positive, mild.	Died.
70. (Same).....	9½ months.	Positive mild.	Died.

AN AID TO THE DIAGNOSIS OF TUBERCULOSIS IN INFANCY AND CHILDHOOD BY MEANS OF THE CUTANEOUS INOCULATION OF DILUTED TUBERCULIN OR PURE TUBERCULIN (PIRQUET METHOD).

By Louis Fischer, M.D.,

Attending Physician to the Willard Parker and Riverside Hospitals of New York City.

The diagnostic value of the cutaneous inoculation with pure or diluted tuberculin has been the subject of controversy for some time. As an aid to the diagnosis of latent tuberculosis this method, so simple in its application, has many advantages.

The absorption of the tuberculin gives a local reaction—a papule—a slight zone of inflammation about 10 millimeters in width, with no constitutional disturbance. There is neither fever nor evidence of general disturbance, and no glandular swelling. This local reaction remains for several weeks in older children, and for from five to ten days in infants.

The diagnosis of tuberculosis in infancy and early childhood is frequently obscure. Following the acute infectious diseases, notably measles, bronchopneumonia, diphtheria, and pertussis, a series of pulmonary symptoms will be noted in which tuberculosis may or may not exist. Cachexia associated with syphilis frequently suggests tuberculosis. Any aid to diagnosis will be welcomed provided it does not subject the little patient to an additional risk and does not devitalize the already weakened system.

In many cases progressive emaciation and symptoms resembling marasmus will be seen, caused by dyspeptic or intestinal indigestion. In obscure lesions involving the lungs, brain, and intestines, especially in the early manifestations, the diagnosis is very often shrouded in mystery. In just such cases we need all the assistance possible in order to arrive at a positive conclusion.

The ocular reaction (Calmette) is not devoid of danger. Although it has been before the profession for but one year, many cases are recorded in which serious eye lesions developed. I have observed marginal ulceration of the cornea, and a similar observation has been made by other investigators in New York. Barbier, in Paris, reports a series of ulcerations of the cornea and pannus following the instillation of a 1 per cent. diluted tuber-

culin solution. Renom also reports three complications in a series of 28 trials in the eye—such, for example, as intense conjunctivitis lasting forty-five days. Another case showed, twenty days after the ocular reaction, extensive interstitial keratitis with iritis. Satterlee reports a serious result following the instillation of a 1 per cent. tuberculin solution in the eye.

Method of Inoculation.—Scarify three small areas of skin, but not sufficiently to produce a bleeding surface. Inoculate a small drop of diluted or pure tuberculin into two of the scarified areas, and leave the third area as a control without inoculating. The method pursued should be similar to the one ordinarily employed in vaccination. The solution used should consist of Koch's old tuberculin, 1 part, sterile water, 3 parts; or Koch's pure tuberculin-old. Inoculate two of the scarified areas, leaving the third area as a control. Von Pirquet* uses one part of tuberculin diluted with one part of a 5 per cent. carbolic glycerin and two parts of a physiological salt solution, employing the same method of inoculation as that just described.

The reaction is the result of a combination of the toxin with antibodies. A noteworthy point is that in infants the reaction disappears within three to four days, and it is safe, therefore, to inoculate again after a few days. In older children the reaction is visible for several weeks. In one of my cases a positive reaction was visible for three weeks. I have inoculated more than 100 cases, and have not seen a single unfavorable result follow. Neither the epitrochlear nor the axillary glands were enlarged at any time after the inoculation.

In my service at the Sydenham Hospital (children's ward), the following series of cases were inoculated during the spring and summer of 1908:

Name.	Age	Clinical Diagnosis.	Result of von Pirquet Test.
Z. K.	1½ years.	Lobar pneumonia	Negative.
P. A.	4 months.	Marasmus, empyema	"
I. W.	2 "	Congenital defect of ears	"
S. S.	2½ years	Erythroderma desquamativa	"
H. F.	5 "	Tuberculous hip	Positive.
L. L.	5 weeks.	Bronchopneumonia, marasmus	Negative.
K. L.	8 years.	Catarrhal appendicitis	"
G. W.	10 months.	Lobar pneumonia	"
A. C.	5 years.	Tuberculous osteomyelitis	Positive.
C. S.	3 months.	Purulent bronchitis	Negative.
C. W.	5 years.	General bronchitis	"
G. A.	1½ "	Lobar pneumonia	"
A. D.	3 months.	Marasmus	"
B. P.	3 days.	Normal	"
H. Z.	6 months.	Rachitis	"
A. B.	3 weeks.	Feeding	"
M. M.	5 years.	Tuberculous hip	Positive.

* In 1908, while making the rounds with Dr. C. von Pirquet in the St. Anna Children's Hospital of Vienna, I noted that, instead of diluted tuberculin, the pure tuberculin (alt Tuberculin, Koch) is used.

Name.	Age.	Clinical Diagnosis.	Result of von Pirquet Test.
M. G..... 6	months.	Marasmus	Negative.
W. K. 3	weeks.	Marasmus	"
D. G..... 2	years.	Bronchopneumonia	"
F. H..... 8	months.	Cervical adenitis	"
C. R.....16	"	Hydrocephalus	"
S. A. 7	"	Bronchopneumonia	"
L. S.....16	"	Bronchopneumonia	"
M. F..... 4	"	Gastro-enteritis	"
F. U.....10	"	Gastro-enteritis	"
A. B..... 2½	years.	Tuberculous meningitis	Positive.
L. R..... 8	"	Sarcoma of kidney	Negative.
J. P. 1½	"	Cerebrospinal meningitis	Positive.
C. P.....14	"	Apex tuberculosis	"
J. A. 17	"	Bone tuberculosis	"
M. F..... 9	"	Malnutrition	Negative.
M. S..... 6	weeks.	Bronchopneumonia	"
M. S..... 8	months.	Miliary tuberculosis	Positive.

The last case was proved post mortem.

Name.	Age.	Family History.	Clinical Diagnosis.	Reaction.
S. B....15	mo.	Negative.	Lobar pneumonia.	Negative.
W. H... 4	yrs.	"	Cerebrospinal meningitis.	"
C. W... 6	mo.	Mother pulmonary tuberculosis.	Gastro-enteritis.	Positive.
R. E....11	yrs.	Father died of tuberculosis.	Gastro-enteritis.	Doubtful.
T. W. .. 1	yr.	Negative.	Bronchopneumonia.	Negative.
M. B....14	mo.	"	Lobar pneumonia.	"
M. H. ..18	"	"	Bronchopneumonia.	"
L. G....10	"	"	Bronchopneumonia.	Negative areas of Consolidation in both lungs; no evidence of tuberculosis. Autopsy.
E. G.... 7	"	"	Bronchopneumonia.	Negative.
F. B.... 7	"	"	Bronchopneumonia.	"
R. S....10	"	Mother pulmonary tuberculosis.	Bronchopneumonia.	Positive.
J. Z. ...14	"	Negative.	Gastro-enteritis.	Negative.
T. R.... 6	yrs.	"	Lobar pneumonia.	"
S. K....10	"	"	Chorea.	"
M. J....20	mo.	"	Gastro-enteritis.	"
R. R.... 4	"	"	Hydrocephalus.	"
J. W.... 6	yrs.	"	Tubercular peritonitis.	Positive laparotomy, excision of cheesy glands. Tuberculosis found.
S. F.... 2½	"	"	Gastro-enteritis.	Negative.
J. F. ...12	"	"	Typhoid.	"
L. M....20	mo.	"	Gastro-enteritis, bronchitis, otitis media.	"
Y. F.... 6	"	"	Gastro-enteritis.	"

In my series of 55 cases here reported there were three autopsies. In the one case in which a positive reaction occurred a general miliary tuber-

culosis was found. In a second case the diagnosis of lobar pneumonia was made *intra vitam*, and a negative reaction was obtained. The post-mortem examination showed lobar pneumonia and no evidence of tuberculosis. In a third case, that of a ten months' old child who died of bronchopneumonia, the von Pirquet reaction was negative. The post-mortem examination showed no evidence of tuberculosis.

In this last group of cases there are three distinct evidences of tuberculosis in the family history. Two of the children from these families gave a positive cutaneous reaction and the third a doubtful reaction.

NUMBER OF CASES OF EACH DISEASE.

Lobar pneumonia:
1 child less than one year old.
4 children between one and two years.
1 child at six years old.

Cerebrospinal meningitis:
1 child between one and two years.
1 child at 4 years old.

Gastro-enteritis:
4 children less than one year old.
3 children between one and two years.
1 child between two and three years.
1 child at eleven years old.

Bronchopneumonia:
7 children less than one year old.
1 child at one year old.
1 child at two years old.
2 children between one and two years.

Chorea:
1 child at ten years old.

Hydrocephalus:
1 child less than one year old.
1 child between one and two years.

Tuberculous peritonitis:
1 child at six years old.

Typhoid:
1 child at twelve years old.

Marasmus:
4 children less than one year old.

Congenital defect of ears:
1 child less than one year old.

Erythroderma desquamativa:
1 child less than one year old.

Tuberculous hip:
2 children at five years old.

Catarrhal appendicitis:
1 child at eight years old.

Tuberculous osteomyelitis:
1 child at five years old.

General bronchitis:
1 child at five years old.

Normal:
1 child less than one year old.

Rachitis:
1 child less than one year old.

Feeding:
1 child less than one year old.

Cervical adenitis:
1 child less than one year old.
Tuberculous meningitis:
1 child between one and two years.
Sarcoma of kidney:
1 child at eight years old.
Apex tuberculosis:
1 child at fourteen years old.
Bone tuberculosis:
1 child at seventeen years old.
Malnutrition:
1 child at nine years old.
Miliary tuberculosis:
1 child less than one year old.
Purulent bronchitis:
1 child less than one year old.

In the foregoing group of cases 8 children suffered with lobar or lobular pneumonia in which a positive diagnosis, excluding tuberculosis, was hardly possible *intra vitam*. With the aid of the von Pirquet inoculation a negative reaction showed the probable absence of tuberculous infection. In a case of coxitis a positive reaction strengthened the diagnosis of tuberculous hip. Another positive reaction was found in a case of osteomyelitis of the foot.

Value of the Reaction.—The presence of a positive reaction means that we are dealing with a probable tuberculosis. Equally important, therefore, is the absence of this reaction—the so-called "negative reaction," by which we can exclude tuberculosis. In some cases a reinoculation is indicated because some children respond slowly and give tardy reactions.

Limitations.—The younger the child, especially if it is between infancy and its third year, the more valuable and the more reliance should be placed upon the presence or absence of the von Pirquet reaction. We must not expect too much from the inoculation with tuberculin, and no one should make a diagnosis of tuberculosis based on a positive cutaneous reaction alone. When symptoms of malaise and general breaking down are noted, or when symptoms of malaria exist, the absence of the plasmodium in the blood with a positive von Pirquet reaction would strongly support the diagnosis of tuberculosis and exclude malaria. In other words, no one symptom should be used to make a diagnosis unless it is supported by systemic manifestations, in which tuberculous suspicion exists.

The presence of the Klebs-Löffler bacillus in the mouth, or the presence of the pneumococcus in the throat, does not justify the diagnosis of diphtheria or pneumonia unless accompanied by clinical evidences of each distinct disease. In like manner no one should isolate a patient and call him tuberculous, basing the diagnosis on the cutaneous manifestation alone, without supporting evidence of organic or local infection giving distinct suspicion of a tuberculous process.

I have previously stated that this reaction is not found in the last stages

of miliary tuberculosis nor in tuberculous meningitis, because at such times the condition of the system is so markedly transformed that there is a tolerance of the maximum doses of tuberculin without apparent effect. In some children it is wise, if the first inoculation proves negative, again to inoculate after one or two weeks. Von Pirquet reports a first inoculation as negative, whereas the second one was positive in his series of cases.

Accidents Resulting from Inoculation.—In my own experience in the hospital and cases seen in private practice there has never been an accident following the inoculation with tuberculin. This same absence of untoward results was noted by me while studying this method in several hospitals in Berlin and Vienna during the summers of 1907 and 1908. The resident staff of the Sydenham Hospital report not a single accident nor infection following the von Pirquet method. The simplicity of the method and the excellent after-effects are sufficient in themselves to justify a more general acceptance of this diagnostic aid. The von Pirquet reaction is of great value in estimating a prognosis. It is absolutely positive as a diagnostic aid in early infancy. It is of great assistance in strengthening a diagnosis of tuberculosis in conditions following pertussis or measles.

When cervical lymph-glands are enlarged, or when enlarged inguinal glands are palpable, the tuberculin inoculation renders great assistance in excluding local inflammatory conditions from general tuberculous manifestation.

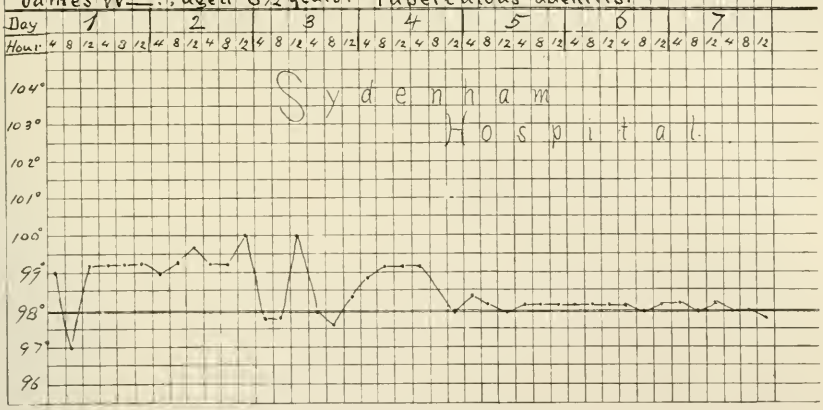
Diagnostico de la Tuberculosis en la Niñez por Medio de las Inoculaciones Cutaneas de la Tuberculina Diluida.—(Fischer.)

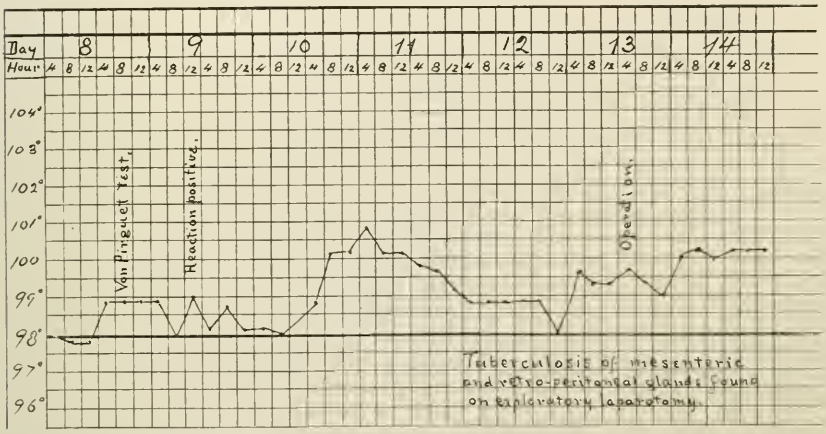
El diagnóstico de la tuberculosis infantil es a menudo oscuro. Asociada a las enfermedades infecciosas agudas ó como una consecuencia a ellas, el diagnóstico es mas dificil. Manifestaciones sifiliticas, con frecuencia, presentan cuadros clínicos de la tuberculosis. La inoculación cutanea ó el metodo de von Pirquet, ha probado ser una ayuda en la sospecha de la tuberculosis latente. La reacción optalmica de Calmette ha dado graves complicaciones del ojo, en America y en Europa. La reacción de Pirquet no presenta tales complicaciones.

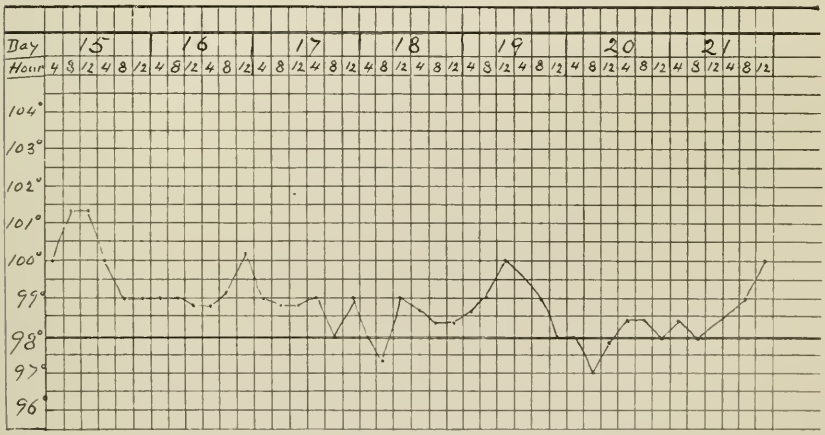
Despues de escarificar tres areas pequeñas de la piel, dos de las cuales solamente son inoculadas, la reaccion es positiva si a las 24 horas ó a mas tardar a las 48 horas, se observa una elevacion como de diez milimetros de ancho, no hay elevación de la temperatura, frio ni disturbios del organismo. Si la primera inoculacion no presentare una reacción positiva, una segunda puede hacerse sin peligro de complicaciones. Si la reacción es positiva, esta sera visible durante siete dias en los recien nacidos. En los ninos de

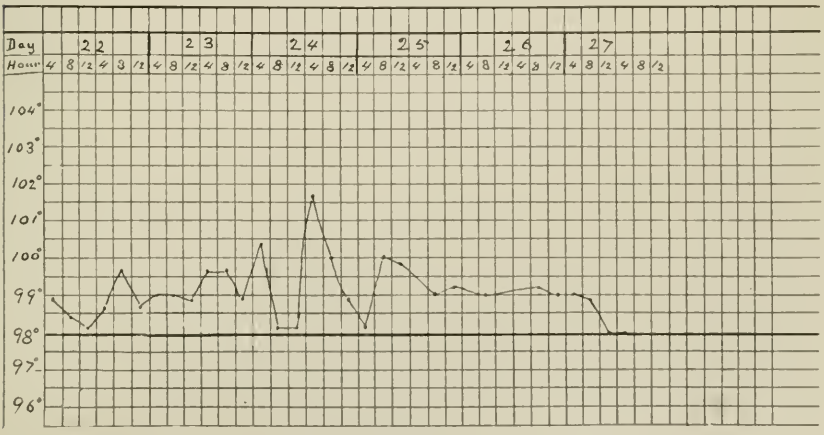
James W—, aged 6½ years. Tuberculous adenitis.

Sydenham Hospital.









mayor edad la reacción permanece por algunas semanas. La reaccion fue positiva en la meningitis tuberculosa, en tuberculosis de la articulación de la cadera, ostitis tuberculosa y tuberculosis pulmonar.

Diagnose der Tuberkulose im Säuglingsalter und in der Kindheit durch die Hautinoculation von Tuberkulin.—(FISCHER.)

Die Diagnose der Säuglingstuberkulose ist häufig obscur. In Verbindung mit den acuten Infectionskrankheiten oder als eine Folge derselben ist die Diagnose schwer zu machen. Syphilitische äusserungen zeigen oft klinische Bilder, die der Tuberkulose sehr ähnlich sind. Die Inoculation nach der cutanen oder von Pirquet'schen Methode hat sich als eine Hilfe in der Stärkung des Verdachtes auf latente Tuberkulose erwiesen. Die Ocular-Reaction von Calmette ist von schweren Augencomplicationen sowohl hier als auch jenseits des Ozeans begleitet gewesen. Keine derartige Gefahr ist mit von Pirquets Methode berichtet worden.

Nachdem drei kleine Hautflächen aufgeschürft worden sind, von denen zwei inoculirt werden und die dritte zur Controlle übrigbleibt, sollte in 24 oder spätestens 48 Stunden eine erhöhte Papel von ungefähr 10 Millimetern Weite gefunden werden was eine positive Reaction genannt werden kann. Es kommt zu keiner Temperatursteigerung, Schüttelfrost, oder allgemeinen Störungen des Systems. Es sind auch keine unangenehmen Nacherscheinungen berichtet worden. Wenn nach der ersten Inoculation keine Reaction auftritt, dann mag einige Wochen später eine zweite Inoculation gegeben werden, ohne irgend welche Gefahr oder üble Folgen. Wenn die Reaction positiv ist, wird sie bei jungen Kindern 5 bis 7 Tage sichtbar sein. Bei älteren Kindern wird sie manchmal mehrere Wochen lang verweilen. Die Reaction war positiv in tuberkulöser Meningitis, tuberkulöser Coxitis, als auch in Lungentuberkulose und tuberkulöser Osteomyelitis.

DIAGNOSTIC VALUE OF LUMBAR PUNCTURE IN ACUTE TUBERCULOUS MENINGITIS OF CHILDREN.

By Frederic E. Sondern, M.D.,

Professor of Clinical Pathology, New York Post-Graduate Medical School. Director of The Clinical Laboratory, New York Lying-In Hospital.

Accurate methods of examination of the cerebrospinal fluid are doubtless of very material benefit in diagnosis and differential diagnosis. While the bacteriological examination has rendered the most brilliant results in positive diagnostic data, and perfected technic has further advanced the efficiency of this single analytical procedure, there is still an uncomfortably large number of cases of tuberculous meningitis in which the bacilli cannot be found.

In view of the great similarity in the symptomatology of meningeal lesions, it is essential that all possible information should be gained from the cerebrospinal fluid. The bacteriology and the cytology certainly present the most valuable information, but as the laboratory examination of the cerebrospinal fluid is still in a state of evolution and many polemic points exist, it is necessary that the procedure be made as complete as possible. The pressure, appearance, density, amount of albumin, and other chemical data, the amount of sediment, the tendency to coagulation, the toxicity, the freezing-point, and the transmission of some administered drugs to the cerebrospinal fluid may be determined. As yet the additional information thus obtained cannot be considered very satisfactory, although it is at times of value as corroborative evidence. Current literature presents many conflicting views, some far too enthusiastic and others in which evident lack of precision is the reason why the procedure is condemned as a diagnostic measure. As in other clinical laboratory work, the information obtained often establishes a diagnosis, but, failing this, it invariably furnishes data that are of use in tentative diagnosis and particularly in diagnosis by exclusion.

The finding of tubercle bacilli in the cerebrospinal fluid is the greatest aid the laboratory can render in the diagnosis of tuberculous meningitis, but in their absence it is essential that as much corroborative evidence as possible be obtained, and particularly facts that will exclude lesions that are in question in the differential diagnosis. It is to a brief consideration

of the technic and results obtained from these analytical procedures that I invite your attention.

Experience teaches that the common error the clinician is likely to make, in this as well as in other laboratory investigations, is that of attempting solely to corroborate the clinical opinion, and failing in this, to abandon the examination. No matter how conclusive the clinical picture, if the laboratory examination of the specimen is to be made at all, it should include at least all valuable points; if the actual diagnostic factor is not found, some corroborative evidence is certainly present. On the other hand, indications of lesions may be found that may overthrow the tentative clinical diagnosis.

Bacteriological Examination.—Opinions concerning the frequency with which tubercle bacilli are found in the cerebrospinal fluid in cases of tuberculous meningitis vary within considerable range, though most of the recent reports are decidedly more favorable than the older ones. Heubner claimed that bacilli are present only in exceptional cases, and in a recent article by Gindes* he states that they are difficult to find early in the disease, at a time when this information is of the most use. On the other hand, Lichtheim and also Breuer † succeeded in finding bacilli in all cases examined. Most observers class their results between these extremes. Friedjung ‡ states that they are difficult to find early, and are frequently present later in the disease. Pfaundler § finds them early in 33 per cent. of cases, and in 75 per cent. of all cases. An average, figured from the results quoted in six other publications, is 69.5 per cent. of all cases. Koplik‖ calls attention to the important point that painstaking search is an essential feature of success. In his earlier work bacilli were found in 64 per cent. of the cases, whereas during the last few years they were found in 89 per cent., and were demonstrated on inoculation in all the remaining cases of the latter group. My personal experience is limited to 29 specimens from 27 cases in private practice, where the subsequent course of the disease and autopsy in 4 cases justified the clinical diagnosis of tuberculous meningitis. In 22 the bacilli were found on the first examination. In 2 others the bacilli were found on the second examination. The percentage of positive results is thus 88 per cent., or practically what Koplik made it in his later series.

Concerning the technic, numerous observers have made the suggestion that it is better to spread the coagulum for purposes of staining than to use the centrifuged sediment and not the coagulum. My experience, however, is that the best results are obtained from a centrifuged sediment be-

* E. J. Gindes: Arch. f. Kinderheilkunde, 1907.
† Breuer: Wien. klin. Rundschau, 1901.
‡ Friedjung: Wien. klin. Wochensch., 1901.
§ Pfaundler: Beiträge z. klin. Med. u. Chir., 1899.
‖ Koplik: Jour. Amer. Med. Assoc., June 21, 1907.

fore coagulation occurs, or if a clot has formed, from the employment of the practice of inoscopy, as recommended by Jousset* or Zebrowski.† The specimens, however prepared, should be stained and decolorized in the usual manner, but not counterstained. The absence of a counterstain is particularly desirable when a prolonged search has to be made. All specimens should also be examined for other organisms, even if tubercle bacilli are present, as the presence of a mixed infection is not only of importance in a consideration of the case, but may explain why the cytology of the cerebrospinal fluid and the result of a blood examination do not correspond to what is usually found in tuberculous meningitis.

By those who have used it to any extent, the inoculation test is considered positive in every instance, the sole objection to its use being the time required to learn the result. This objection, in all but exceptional cases, renders it useless, and a quicker and just as accurate a result may be obtained by the direct search for bacilli, repeated as often as may be necessary. Although bacilli may not be found in the first or second specimen, it is reasonable to believe that subsequent examinations will disclose their presence long before the positive outcome of an inoculation test becomes apparent.

In this connection the recent article by Much‡ may be of interest. He asserts that there are forms of tubercle bacilli that are not acid proof, and consequently do not stain by the usual methods employed. If these observations are correct, they may explain why tubercle bacilli are sometimes not found in obviously tuberculous lesions, and also the difficulties encountered in the demonstration of these organisms in the cerebrospinal fluid.

Cytology.—The morphological study of the leukocytes in the cerebrospinal fluid has resulted in giving us some rather definite diagnostic data. This is by no means so conclusive in any instance as the finding of the causative organism, but it is always helpful and stimulates the search in one or other particular direction for bacteria, as well as for conclusive clinical signs. The essential facts are the relative prevalence of lymphocytes or of polynuclear cells, but one must not fall into the error of believing, as is so often stated, that lymphocytes indicate tuberculosis, and polynuclear cells an acute pyogenic process, for there have been too many exceptions found to this crude rule. The significance of a relative lymphocyte increase or of a polynuclear cell increase depends on a number of factors, the careful consideration of which determines the value of the cyto count in the given case.

The results are most accurate in fully developed acute cases of meningitis, less so in the very early stages, and still less so in the later stages or during

* Jousset: La semaine méd., 1903. † Zebrowski: Deut. med. Woch., 1905.
‡ Much: Beiträge z. Klinik d. Tuberculose, viii.

convalescence, as the case may be. In the fully developed acute stage of meningitis an excess of lymphocytes tends to indicate a tuberculous process, whereas an increase in the relative number of polynuclear cells would speak rather for a meningitis due to streptococci, staphylococci, pneumococci, or meningococci, the differential diagnosis depending on the bacteria found.

While a relative lymphocyte increase, under the circumstances cited, is suggestive of tuberculosis, in the absence of tubercle bacilli the following exceptions must be kept in mind. Typhoid fever with meningeal symptoms and without a mixed infection will show a relative lymphocyte increase, usually without bacteria, as long as the symptoms last. Meningism accompanying pneumonia, mumps, and numerous other diseases in children, if there is an increase of leukocytes in the cerebrospinal fluid, will at first also show an excess of lymphocytes and no organisms; if this condition develops into a true meningitis, the polynuclear cells then show a relative increase, and the etiological bacteria are found. It seems more difficult to explain why a relative polynuclear increase should sometimes occur in tuberculous meningitis. I have met this exception in one case only, and was able to demonstrate a mixed infection of tubercle bacilli and pneumococci. It is, however, described in a relatively small number of cases by most observers, and constitutes the chief reason why the value of cytology has been discredited, as, for example, by Mützner. The existence of a mixed infection would seem to be the most plausible way to explain this anomaly, and this is also the belief of Ross,* who has found evidences of it in a number of cases, and of Frank Eve, of Hull, who obtained staphylococci in cultures from these cases of tuberculous meningitis, verifying the diagnosis at autopsy.

It seems unfortunate that, in a large number of publications in reference to cytology as a diagnostic factor, there are comparatively few citations of the actual figures obtained. My series of 15 counts in tuberculous meningitis shows the following:

	Lymphocytes.	Polynuclear Cells.
1	88 per cent.	12 per cent.
2	75 "	25 "
3	96 "	4 "
4	90 "	10 "
5	82 "	18 "
6	77 "	23 "
7	97 "	3 "
8	82 "	18 "
9	96 "	4 "
10	28 "	72 "
11	80 "	20 "
12	68 "	32 "
13	97 "	3 "
14	90 "	10 "
15	88 "	12 "

* Ross: Brit. Med. Jour., September 21, 1907, p. 742.

Excluding the No. 10 count, which was the cited case in which evidences of a mixed infection were found, the average lymphocyte percentage was 86. Koplik,* in detailing the results obtained in 19 specimens, finds that 17 of these the relative percentage of lymphocytes was over 70. The degree of increase of the one or other variety of leukocyte should always be noted, as I believe further experience will attach importance thereto. For example, in the case of mixed infection quoted the polynuclear percentage was 72, which is considerably lower than what we usually find in non-tuberculous meningitis of one or other type. Obviously, a large amount of additional data will be necessary before conclusions on this point are justified.

A consideration of cytological changes at times other than in the fully developed acute stage of a meningitis would take us too far afield, and, unfortunately, to little or no purpose.

Concerning the technic, slides, and not cover-glasses, should be thinly spread with the sediment, and stained with one of the polychrome blood-stains that should be diluted. I prefer a mixture of Jenner and Wright, on account of obtaining the more distinct nuclear stain of the former, and the clear neutrophilic granulations of the latter.

Pressure of the Cerebrospinal Fluid.—Several simple and ingenious methods have been devised for the determination of the pressure, and a number of observations have been published; for example, those of Quincke,† Sicard, and Krönig.‡ It is generally believed, however, that those practising lumbar puncture soon learn to form an opinion as to the approximate degree of pressure, which is generally increased in direct ratio to the extent of exudation. The clinically important point is that increased pressure is significant; but the accuracy obtained by the use of a manometer is not necessary, particularly as the pressure in the tapping instrument is often no guide to the pressure above, on account of frequent obstructions. Tschernoff is quoted by Gindes as saying that a serous meningitis remains a serous meningitis be the pressure 15 mm. or 120 mm., and this seems a sensible argument. For practical purposes, then, the pressure noted on puncture serves as a guide to the amount of accumulated exudate, provided no obstruction to the flow exists.

Appearance.—In typical cases of tuberculous meningitis the fluid is perfectly transparent and colorless. I have found no exception to this rule except in the case of mixed infection, but Friedjung§ claims to have observed considerable turbidity, and G. C. Robinson‖ also speaks of a slight opalescence and turbidity. In meningitis due to the meningococcus and the pneumococcus the fluid is usually turbid, and in the presence of pyogenic organisms it is often distinctly purulent.

* Koplik: Loc. cit.
† Quincke: Berlin. klin. Woch., 1891.
‡ Krönig: Berlin. klin. Woch., 1897.
§ Friedjung: Loc. cit.
‖ Robinson: Bull. Ayer Clin. Laboratory, No. 4.

Density and Molecular Concentration.—The specific gravity, which is normally about 1006, is increased in meningitis, as in other serous exudates, in proportion to the increase in the amount of albumin. The same applies to the degree of molecular concentration, as determined by cryoscopy. Both of these procedures are of value in the differential diagnosis of afebrile chronic brain lesions, but are quite secondary in the condition under discussion.

Chemistry.—The amount of albumin is increased in all acute inflammatory meningeal lesions and in tuberculous meningitis, offering but little, if any, aid in their differential diagnosis. It is, for example, low in some cases of chronic hydrocephalus, slowly developing brain tumors, and in some cases of serous meningitis, and high in other cases of hydrocephalus and in the acute conditions mentioned. In the 15 specimens from cases of tuberculous meningitis the maximum found was approximately 2 parts per mille by weight, and the minimum approximately $\frac{3}{4}$ per mille by weight. Other observers report both higher and lower figures. Other chemical problems, such as the amount of urea, the presence of sugar, and the presence of cholin are engaging the attention of the scientist, but are as yet of no established practical value, particularly in the condition that now engages our attention.

Sediment.—The amount of sediment in tuberculous meningitis is usually quite slight. This feature serves, to some extent, as a differential point, and has led to efforts to determine scientifically the number of cells in a given amount of fluid, by much the same method as is used in the examination of the blood. Fuchs and Rosenthal have constructed a special chamber for this purpose, and Purves Stewart published his results with it. In general it may be said that the experienced laboratory worker can easily determine if an increase in cells is present, and approximately to what degree. The additional refinement serves about as little practical purpose as the determination of pressure by means of the manometer, as previously mentioned.

The cytology of the sediment has been considered. Aside from the bacteriology, it is doubtless the most important feature of the examination.

The occurrence of spontaneous coagulation in the specimen was formerly considered an absolute indication of an inflammatory exudate, and was relied upon by many as a distinct diagnostic feature in meningitis. This opinion, though still held by many, has been disturbed by the publication of cases of brain tumor and consequent stasis in which distinct coagulation of the cerebrospinal fluid occurred. In tuberculous meningitis the coagulum is usually very frail and spider-web like, whereas in acute meningitis of other type the clot is generally large and firm.

Toxicity.—French and Italian observers have devoted considerable

attention to the toxicity of the cerebrospinal fluid, but as yet no practical results of use in diagnosis have been attained.

Transmission of Administered Drugs.—Griffon and Sicard found that they could recover iodin in the cerebrospinal fluid after the administration of potassium iodid in normal persons and in cases of purulent meningitis, whereas there was no such transmission in cases of tuberculous meningitis. Lehri denies this emphatically, and von Jaksch claims that no iodin can be demonstrated under any circumstances. The subject is an attractive one, and is certainly worthy of experiment.

In conclusion, the chief diagnostic and differential features of tuberculous meningitis are tabulated:

Pressure: Increased.

Appearance: Usually transparent and colorless, occasionally slight opalescence.

Density: Not much increased.

Albumin: From $\frac{3}{4}$ to 2 per mille by weight.

Coagulation: Slight and frail.

Sediment: Slight.

Cytology: Average number of lymphocytes, 86 per cent.

Bacteriology: Tubercle bacilli found in about 88 per cent.

In the presence of tubercle bacilli a relative polynuclear cell increase should stimulate the search for organisms of a second or mixed infection, particularly if the sediment is more abundant and coagulation pronounced.

In the absence of tubercle bacilli and other organisms, if relative lymphocyte increase and the other suspicious signs exist in an acute febrile case, repeated search for bacilli is indicated, and the other causes for the combination should be kept in mind, namely, the meningism of typhoid, pneumonia, and infectious diseases.

Abundant sediment, relatively high polynuclear cell count, firm coagulation, decidedly increased density, and large amount of albumin indicate a purulent meningitis, and the causative organism, pneumococcus, streptococcus, or staphylococcus, is invariably found. The differential diagnosis between this class of cases and those of tuberculous meningitis never offers any difficulty.

Cerebrospinal meningitis due to the intracellular diplococcus sometimes presents specimens that closely resemble those from a tuberculous meningitis. The differentiating points are that the relative polynuclear cell increase is high—usually over 85 per cent.—even if the number of cells present is small, and that the characteristic organisms are invariably found, according to most authors, and were present in 96 per cent. of the cases in my series.

El Valor Diagnóstico de la Puntura Lumbar en la Meningitis Tuberculosa Aguda de los Niños.—(SONDERN.)

El examen bacteriologico del fluido cerebro-espinal proporciona el mejor servicio en el diagnóstico, aunque el examen citologico es también importante, particularmente si se trata de los casos en los cuales el examen bacteriologico da un resultado negativo. Los informes que se obtienen de la presión, apariencia, densidad, la tendencia á la coagulación, las propiedades toxicas, del fluido y la trasmisión de ciertas drogas administradas en el fluido cerebro-espinal, es muchas veces de un valor incontestable, mas estos son secundarios en importancia. El examen deberá ser tan completo como las circunstancias y la cantidad de fluido obtenido lo permita.

El diagnóstico principal y los aspectos diferenciales son: en la meningitis tuberculosa la presion del fluido cerebro-espinal es aumentada; la apariencia por lo general transparente y sin color, ocasionalmente opalesente; la densidad no es notablemente aumentada; la albumina es de $\frac{3}{4}$ y 2 por mil de peso; coagulación ligera y debil; cedimento ligero; citología, el termino medio del numero de linfocitos es de 86%; bacteriología, el bacilo de la tuberculosis se encuentra en 88% de los casos.

Si el bacilo de la tuberculosis se encuentra, un aumento relativo de las células polinucleares indica una infección mixta. En la ausencia del bacilo, si los linfocitos predominan, el examen deberá repetirse, y deberá dirigirse la atención á la posibilidad de una meningitis tifoidea, neumónica, etc. Pruebas purulentas por lo general no presentan dificultad en el diagnóstico. El aumento relativo de las células polinucleares y la casi invariable presencia del diplococus intra-celular, sirve de diferencia de los casos de la meningitis cerebro-espinal.

Valeur diagnostique de la piquûre lombaire dans la méningite tuberculeuse des enfants.—(SONDERN.)

L'examen bactériologique du liquide cérébro-spinal nous rend de grands services dans le diagnostic; mais la cytologie en est importante aussi, surtout quand les bactéries en sont absentes. Les renseignements sur la pression, l'apparence, la densité, la quantité de l'albumine et les autres données chimiques, la quantité du sédiment, la tendance à la coagulation, la toxicité, le point de congélation et la transmission de médicaments administrés au liquide cérébro-spinal, tout cela a souvent une valeur décisive, mais secondaire à l'examen bactériologique. L'examen doit être aussi complet que le permettent les circonstances et la quantité du spécimen obtenu.

Les principaux signes diagnostiques et différentiels sont: Dans la ménin-

gite tuberculeuse la pression du liquide cérébro-spinal est augmentée, le liquide est d'habitude transparent et incolore, parfois légèrement opalin, la densité pas beaucoup augmentée, l'albumine pèse entre 0.75 et 2 pro mille, le coagulum est peu volumineux et frêle, il y a peu de sédiment. Comme cytologie, le nombre moyen des lymphocytes est de 86%. Concernant la bactériologie, les bacilles de la tuberculose sont présents dans 88% des cas.

Si des bacilles de tuberculose sont présents, une augmentation relative du nombre des cellules polynucléaires peut indiquer une infection mixte. En l'absence des bacilles, si les lymphocytes prédominent, il faut recommencer l'examen, et on ne doit pas perdre de vue la possibilité de symptômes méningitiques dûs à la fièvre typhoïde, à la pneumonie, etc. Les spécimens purulents sont généralement faciles à diagnostiquer. Enfin, les cas de méningite cérébro-spinale se distinguent par l'augmentation relative du nombre des cellules polynucléaires et par la présence presqu' invariable des diplococques intracellulaires.

Der diagnostische Wert der Lumbarpunktion in acuter tuberkulöser Meningitis bei Kindern.—(Sondern.)

Die bacteriologische Untersuchung der Cerebrospinalflüssigkeit leistet den besten Dienst in der Diagnose, obwohl die Zellkunde auch von Wichtigkeit ist, ganz besonders in der Abwesenheit von Organismen. Die praktische Information, erhalten von Druck, Erscheinung, Dichtigkeit, Menge von Eiweiss und anderen chemischen Daten, die Menge des Sediments, die Tendenz zur Gerinnung, die Giftigkeit, der Gefrierpunkt und die Uebertragung mancher der mit der Cerebrospinalflüssigkeit in Verbindung gebrachten Droguen ist manchmal von entschiedenem Werte, aber immer erst in zweiter Linie gegenüber dem oben Erwähnten. Die Untersuchung sollte so vollständig sein, als die Umstände und die verwertbare Menge des Specimens es erlauben.

Die hauptsächlichen diagnostischen und Differenzirungspunkte sind folgende: In tuberkulöser Meningitis ist der Druck der Cerebrospinalflüssigkeit vermehrt; der Anblick meistens durchsichtig und farblos, gelegentlich leicht opalisirend. Die Dichtigkeit ist nicht sehr vermehrt; das Eiweissgewicht ist zwischen dreiviertel und zwei auf tausend, das Gerinnsel dünn und schwach. Sediment schwach. Zellzählung: Durchschnittszahl der Lymphocyten 86%. Bacteriologie: Tuberkelbazillen anwesend in 88% der Fälle.

Wenn Tuberkelbazillen anwesend sind, so mag ein relatives Anwachsen von polynucleären Zellen eine Mischinfection andeuten. Bei Abwesenheit von Bazillen und wenn Lymphocyten überwiegen, sollte die Suche wieder-

holt und die Möglichkeit einer Pseudomeningitis von Pneumonie oder Typhus in Erwägung gezogen werden. Eitrige Specimene geben für gewöhnlich keine Schwierigkeiten für die Diagnose. Die relative Vermehrung der polynucleären Zellen und die meist nicht wechselnde Gegenwart von intracellulären Diplokokken unterscheiden Fälle von cerebrospinaler Meningitis.

DISCUSSION.

Dr. E. Libman (New York): At the Mount Sinai Hospital in New York city we have examined over 900 cerebrospinal fluids. The work on the fluids from tuberculous cases was done mainly by Dr. E. P. Bernstein.* The cases reported by Dr. Koplik and referred to by Dr. Sondern were nearly all studied by Dr. Bernstein. In his first investigation he found the bacilli during life in over 94 per cent. of the cases. In the last one hundred cases he found the bacilli every time. He spreads the coagulum, if there be one, and the sediment on one cover-glass. Patience on the part of the investigator is of great importance in searching for the bacilli. In Dr. Bernstein's paper the percentages of polynuclear cells and lympocytes found in the various fluids are detailed.

In so-called meningismus we have also occasionally found a lymphocytosis; but, in that form complicating mastoid disease, there may be a polynucleosis. Dr. Rist tells me he has had similar experiences.

The fluid in tuberculous meningitis may have a yellowish tinge. This can occur in other conditions. The copper-salt reducing substances may be present (rarely) in tuberculous meningitis. Its absence speaks against a serous meningitis. It is of value to determine the pressure, especially in doubtful cases; for, in cases of tumor in the posterior fossa (which may resemble tuberculous meningitis), death may occur after puncture. In these cases there is a rapid drop in pressure after the removal of a small amount of fluid. This may be regarded as a warning to withdraw no more fluid.

* Reported in Mount Sinai Hospital reprints, vol. v

AN EXPEDITIOUS METHOD FOR THE DETECTION OF TUBERCULOSIS AMONG SCHOOL-CHILDREN.

By C. Harlan Shoemaker,
Philadelphia.

The method set forth in this paper will not only detect those children in poor health in the schools, whose general welfare is a matter of public concern, but will be as applicable to any large body of individuals, whether in stores or in shops, as to school-children.

Fortunate, indeed, is the medical inspector of schools whose work is confined to the inspection of 5000 children, without the interruption consequent upon his withdrawal for other sanitary work. This relation time to work allotted is very important in the elimination of any disease or in the correction of defects. Hence the necessity for such assistance as can be depended upon for the segregation of the suspiciously ill, the sick, and the defectives. It seems to me a great waste of time for a medical inspector to test the vision by Snellen's test-types. In fact these statistics should be tabulated and handed to him three hours after school is convened. Preliminary examination should and could be made by each individual teacher of her class at least twice a year, thus sorting out for the medical inspector a sufficient number of children to occupy his entire time. Furthermore, it will be the first step toward substituting results for statistics. We should not be interested in healthy children, nor allow them to consume so much of our attention, so long as the suspiciously ill, the sick, or the defective child remains untreated.

The relative importance of spending the inspector's time percussing lungs, and overcoming parental objections, in order that 1 per cent. of tuberculous children may be detected, as compared with the importance of relieving 60 per cent. of the children of physical defects, is exaggerated, because from 8 to 12 per cent. of the tonsils and adenoids removed are found to be tuberculous, so that even the detection of these defectives is a wise public policy. I doubt if we can ever make the children physically perfect before their education is begun by the State, but that privilege should certainly be understood as granted when the education is begun. Whatever benefits the child, must ultimately benefit the State.

Let us imagine, if we can, that 1 per cent. of the school-children are

tuberculous; also that a skilled diagnostician should have 5000 under his control, and, at the end of the semester, he will have examined 500 chests and found 5 children afflicted; he has then allowed 4500 children not examined in any way, of whom 45 may be said also to be tuberculous, to pass an entire term together.

I do not believe that an inspector should interest himself in the exact location of a lung cavity, any more than in the exact etiology of the contagious eye diseases that come under his observation. The first object of an inspector is to locate all suspicious cases of contagious disease. The second object should be to have all doubtful diagnoses confirmed by an expert. And, what might be called his third object, is the return of the child to school cured. The last duty he should be relieved of, because it greatly complicates his work.

We most probably shall not entirely control the school problem of tuberculosis unless dispensaries are established under the departmental jurisdiction. In this way only can an official record be kept. The fallibility of fever, cough, râles, and the like, as means of establishing an absolute diagnosis in children, is generally conceded. Even in the late stages the absence of expectoration is usual in children. The presence of tubercle bacilli in the feces seem to be a very reasonable diagnostic point. Nearly all children that I have seen swallow their sputum.

In Philadelphia, from five to seven very evident and most probably contagious cases of tuberculosis have been reported each year of medical inspection. There were 159,217 children on the school register for the year 1906. Of these, 8 children were reported by the medical inspector as being evidently tuberculous.

The division of vital statistics reports, during the year, the following deaths from tuberculosis:

	Under 1.	1 to 2.	2 to 5.	5 to 10.	10 to 15.	15 to 20.	Boys.	Girls.
Lungs	49	27	31	30	47	309	209	284
Meningitis	56	42	53	28	10	7	109	87
Abdominal	7	2	7	3	4	13	16	20
Pott's	—	—	1	3	2	2	6	2
White swelling	—	—	—	—	2	—	2	—
Tuberculosis of other organs	4	3	—	1	—	6	9	5
General	2	2	1	—	—	—	3	2
Scrofula	—	—	1	—	—	—	1	—
Totals	118	76	94	65	65	337	355	400

The estimated population of the city of Philadelphia is 1,500,395. There were more deaths among infants than in any other age period excepting

that of from fifteen to twenty years. Nevertheless the infant mortality has fallen 10 per cent. in twenty-seven years. The infant mortality from tuberculosis is 0.07 per cent. of the total population. We cannot get a percentage of mortality at age periods in America except during a census year, so that accurate comparison of American and foreign statistics is impossible. Disregarding the infant mortality for the moment, the death-rate from two to five, a period of three years, is higher than that of from five to ten or ten to fifteen years. This ratio is different from foreign statistics, where the greatest vulnerability to tuberculosis in children is shown to be just before and during pubescence.

There is a rather wide discrepancy between 130 deaths from tuberculosis among children of the compulsory school age—that is, from five to fifteen years (according to Philadelphia law, eight to fourteen)—and the actual report of 8 cases. From a series of cases reported by Cronin, of New York, last year, only 10 out of the number were possibly tuberculous. No doubt the discrepancy between the death-rate and the morbidity rate, per age period, is the same in New York as in Philadelphia. If we suppose that the medical inspector has not overlooked any tuberculous children under his care, then but one solution offers itself to account for this difference between the mortality and morbidity rate at the compulsory school age, and that is the voluntary withdrawal of the sick before they reach the stage in which the disease can be detected at a glance without the removal of the clothing. Experience, however, teaches me that the same rule holds good among adults—this voluntary withdrawal of the sick from the large factory to the small shop, and from the latter to home work, so it is fair to suppose that a sick child might be humored.

Our inability to reach conclusions, through the examination of all the children from houses occupied by tuberculous families, is hindered by the vast number of normal children that must be examined in order that very few afflicted children may be detected. The difficulty of applying the foregoing rule may further be illustrated by the overwhelming number of children who would have to be examined if all the children from infected homes in the fifth ward were selected. The Phipps Institute occupies almost the geographical center of the ward, which comprises 35 city squares, with a total population of 17,130, or 83.3 persons per acre. The death-rate in this ward, exclusive of the Phipps Institute, is 61.3 per 10,000, or at least twice that of any other ward, and three times what it was before the Phipps Institute located there. It is evident, from the mortality report alone, that an inspector could never approach his routine school work in this neighborhood. The fact that a few consumptives escape being reported would lead to the oversight, perhaps, of the very children who need the examination most. But the converse view of this house rule, the inspection of the dwellings of

tuberculous children, would work admirably among consumptives, young or old.

Knopf stated last year that tuberculosis cannot be eradicated if we do not begin with the child. This reinforces my assertion that it would be more practical to investigate the homes of children found to be tuberculosis suspects, or actually afflicted with the disease, in order that we might ascertain who infected the child and invent means to restrict further dissemination.

The following method for the continuous observation of this disseminating focus of the tubercle bacilli without discomfort to the public or patient is suggested: After the usual notification of a patient suffering with tuberculosis has been received, it should be placarded upon a very accurate map before it is filed away in the card catalogue. A conveyancer's map, such as gives the lot frontage, character of dwelling, drainage, etc., will answer the purpose admirably. A sticker bearing the date, stage of disease, and the patient's initials $\frac{\text{8-23-08}}{\text{2}}$ $\frac{\text{}}{\text{S. R.}}$ is to be placed upon this dwelling.

It can then be forgotten until subsequent reports draw attention to it. A vigilant Bureau of Health will draw at least four notifications on each patient as his end draws near, for at least one-half of the physicians in attendance will report the case. If, however, these reports should show several families infected in the same dwelling year after year, drastic action could be well aimed. Reports card-catalogued make good statistics, whereas those charted are vital.

Very little, and that chiefly of an educational nature, is done for the individual harboring the tubercle bacilli. Excepting for the Philadelphia hospital and a few beds in one or two other institutions, the advanced contagious case cannot secure isolation.

The necessity of a rapid method for the detection of incipient cases of tuberculosis, so that teachers and shop foremen may have some point of observation to confirm their suspicions, is apparent. We will never have a sufficient number of inspectors to fill these places. The people must be educated to do the grosser part of the work, and they must have some tangible basis upon which to work.

The teacher with a broader humanitarian outlook may be taught to watch her charges, whereas the shop foreman, urged on by an anxious employer, could be aroused to do his full duty by obtaining a certificate of health for doubtful cases. The employer's anxiety could be aroused by a well-ordered liability law, similar to the English law, which would necessitate the insurance of all help in his employ. Doubtless he would see that all

employees were declared to be healthy, and surely free from tuberculosis, before he employed them.

The best method for separating the robust child from the delicate one that can be put into the hands of the laity is by means of a torsion balance. Let us weigh our children monthly. At the end of the second month, those who had lost the most weight should be sent to the inspector. In due time another weighing would send down another class. At first the lack of interest, change of clothes, and the desire to fake weight would cause an amount of uncertainty, but as the innovation wore off and the value of the method for the determination of sick and well proved itself, this element would entirely disappear. There is no clinical sign so reliable or so expeditiously ascertained as the body weight. All healthy children gain in weight. This fact relieves us of the necessity of taking the height, which is a very important point when dealing with adults. The report of the examination by the inspector, of those who lose or remain stationary in weight, can be confirmed by the more complete examination of an expert, and may be followed by an inspection of the family and dwelling if the child is proved to be tuberculous. What we should expect to find among those children losing weight would be, in all, poor nourishment, especially among those who come to school without breakfast, and children attacked by infectious or contagious diseases.

We want to eliminate from our examinations all apparently healthy children and the necessity for handling them. This latter is the point of contention among parents. Seldom, if ever, do parents object to attention paid to a sick child, but they rise, wrathful, at our approach to a healthy one.

Conclusions: I. The determination of the loss of weight in the incipient tuberculous child is more easily made than any method heretofore proposed for the examination of children from houses where tuberculosis exists—and it reaches all the children.

II. The determination of the loss of weight is easier and of greater clinical importance than vague physical signs. It has the advantage of being applicable to every child, and it does not necessitate unnecessary handling.

III. A torsion balance showing fluctuation in the body weight of a child, distinguishes those that are healthy from those that are sick. This rapid discrimination between the two classes of children is necessary in order to save time.

EIN RESOLUTIONSVORSCHLAG.

Von Dr. Adolf Bäumel,
Eger.

Die Sektion IV des diesjährigen Kongresses soll sich mit der Bekämpfung der Tuberkulose bei Kindern beschäftigen; könnte sie dies mit einiger Gründlichkeit tun, so wäre der böse Feind nach einiger Zeit aus der Welt geschafft, aber Wollen und Können halten nicht gleichen Schritt miteinander und da wird es notwendig sein, ausser den zweckmässigsten Massregeln auch die durchführbarsten herauszusuchen. Ich glaube nichts Undurchführbares zu verlangen, wenn ich beantrage, der Kongress möge die folgende Resolution beschliessen und den Regierungen aller civilisierten Länder des Erdenrundes,—nicht nur jener, die auf dem Kongresse vertreten sind,—zur ehesten Durchführung empfehlen:

Der Kongress hält als vorläufigen Schritt zur gründlichen Bekämpfung und Ausrottung der Tuberkulose für notwendig:

1. Dass in allen Anstalten, in denen Kinder zu Ueberwachungs- und Unterrichtszwecken dauernd oder für längere Zeit untergebracht sind (Waisenhäuser, Kindergärten, Kleinkinderbewahranstalten, Schulen), die Anstaltserhalter dazu verpflichtet werden, die Zöglinge in regelmässigen Zwischenräumen, mindestens aber zweimal in jedem Jahre einer gründlichen ärztlichen Untersuchung unterziehen zu lassen.

2. Dass über das Resultat dieser Untersuchungen nicht nur nach gleichen Grundsätzen zu verfassende Listen geführt, sondern auch für jedes einzelne Kind als Auszug dieser Liste ein Gesundheitszettel verfasst werde, der bei Uebergang in eine andere Lehranstalt dieser zu übergeben, bei Abschluss der Unterrichtszeit aber auf Wunsch dem gewesenen Schüler einzuhändigen wäre.

3. Dass die Anstalts(Schuler)halter gesetzlich berechtigt und verpflichtet werden, in allen jenen Fällen, wo bei einem Kinde Zeichen von manifester oder latenter Tuberkulose oder Vorkrankheiten, die erfahrungsgemäss zu tuberkulösen Erkrankungen führen, festgestellt werden, eine zweckentsprechende Behandlung dieser Kinder einzuleiten, wenn nicht die Elter noder sonstigen Angehörigen der Kinder den Nachweis erbringen, dass dieses von ihrer Seite aus geschieht.

Begründung:

ad 1.) Es braucht den Teilnehmern an diesem Kongresse nicht erst gesagt zu werden, dass in den meisten Fällen von Tuberkulose—wenn nicht in allen—der Beginn der Erkrankung in die ersten Lebensjahre fällt und dass, je eher die ersten, unscheinbaren Symptome der Krankheit konstatiert und in Behandlung genommen werden, desto eher auch Aussicht darauf ist, dass das Uebel dauernd oder doch für längere Zeit zum Stillstand gebracht werde. Es ist selbstverständlich, dass es am rationellsten wäre, die Kinder von der Geburt an zu überwachen, die Erkrankten sofort zu behandeln und so vor den Fortschritten der Erkrankung zu bewahren; ebenso klar ist es aber, dass sich dieser Art des Vorgehens weit grössere Schwierigkeiten entgegenstellen würden, als der vorgeschlagenen, so dass sie vorläufig als nicht durchführbar bezeichnet werden muss.

Sind aber erst die Kinder seitens der Eltern einer Erziehungs- oder Unterrichtsanstalt, sei es ganz, sei es für mehrere Stunden täglich, anvertraut, dann kann das Gemeinwesen geltend machen, dass jedes einzelne Kind, das erkrankt, für die anderen eine Gefahr bildet und kann für sich in Anspruch nehmen, sich durch seine Organe davon zu überzeugen, welche Kinder gesund und welche dies (im weitesten Sinne) nicht sind, kann aber auch verlangen, dass bloss solche am Unterrichte teilnehmen, die für die übrigen nach keiner Richtung eine Gefahr bilden, auch nicht nach der gesundheitlichen.

In vielen Ländern bestehen bis zum heutigen Tage schulärztliche Einrichtungen überhaupt nicht; in anderen sind wohl Aerzte im Nebenamte bestellt, doch kommen sie selten dazu, alle Schüler regelmässig und gründlich zu untersuchen und so rechtzeitig das Auftreten der Tuberkulose (und anderer Krankheiten) wahrzunehmen; wohl an den allerwenigsten Orten sind die Aerzte in der Lage, unabhängig von gewissen Zufälligkeiten, wie sie die Aufmerksamkeit des Lehrpersonals, der Stundenpläne u. s. w. bedingen, ihr präventives Amt auszuüben. Es kann dies nur dann geschehen, wenn Gesetzesnormen geschaffen werden, die die Untersuchung nicht nur gestatten, sondern auch obligatorisch machen.

Wenn wir nun in Betracht ziehen, dass die Tuberkulose vorwiegend eine Krankheit der Armen insofern ist, als bei diesen nach jeder Richtung ungünstige hygienische Verhältnisse gegeben sind, wo leichter Familieninfektion in engen, schlecht gelüfteten Wohnräumen stattfindet, wo auf die Sauberkeit nicht jene Aufmerksamkeit verwendet werden kann, wie bei besser situierten Leuten, und wo die Infektion, wenn sie stattgefunden hat, in dem Körper des schlechtgenährten Kindes leichter zur Ausbreitung gelangt, eventuell auch schon frühzeitig zu Zerstörungen führt, dann leuchtet ohne weiteres ein, dass das Aufsuchen der Ersterscheinungen der Krankheit sich ausser auf die Schulen auch auf jene Anstalten erstrecken muss, wo

hauptsächlich die Kinder der armen Arbeiterbevölkerung untergebracht werden, während die Eltern, erwachsenen Geschwister u. a. dem Erwerbe nachgehen müssen; das sind eben die Kindergärten und Kinderbewahranstalten, woraus noch der Vorteil erwächst, dass ein Teil der Kinder noch vor dem schulpflichtigen Alter der ärztlichen Ueberwachung zugeführt wird.

ad 2.) Dieser Punkt bedarf kaum einer näheren Begründung. Die Listen werden nicht nur als Grundlage zu einer reellen Statistik des Kindesalters dienen und zeigen können, wie gewisse Krankheiten im Laufe der Jahre zu- oder abnehmen, oder wie sich die Gesamtentwicklung in einer bestimmten Gegend im Laufe der Zeit in progressiver oder degenerativer Richtung ändert (Körperbau, Gewicht, Brustumfang, etc.), sie werden auch insbesonders in Form des Gesundheitszettels (der als Kopie der Eingetragenen in die Liste gedacht ist), ermöglichen, eine verlässliche Anamnese über jedes jugendliche Individuum zu erlangen, und es ist dies von hoher Wichtigkeit nicht nur beim Uebergange von einer Erziehungs- oder Lehranstalt in die andere, aber auch späterhin bei der Berufswahl, wo ja ein Missgriff unter anderen Schädlichkeiten auch die Gefahr mit sich bringt, dass z. B. ein Individuum, welches bei ländlicher Arbeit sehr wohl gesunden und erstarken könnte, in einen gewerblichen Betrieb kommt, der demselben den sicheren Ruin bedeutet.

ad 3.) Am notwendigsten erscheint, dass das Prinzip der Zwangsbehandlung gesetzlich festgelegt werde. Wenngleich zweifellos ist, dass um so bessere Aussichten für die vollkommene Ausheilung der Tuberkulose vorhanden sind und dass dies mit um so geringerer Störung des Fortganges der Arbeit (Unterrichtes) erfolgen kann, je eher d. i. in einem je früheren Stadium der Krankheit an die Behandlung der Leidenden oder Gefährdeten geschritten wird, so ist es doch schwer, meistens sogar unmöglich, die Kranken oder deren Umgebung davon zu überzeugen, dass dieses oder jenes Kind, das scheinbar ganz gesund ist, nicht hustet, nicht fiebert, doch schon Anfangserscheinungen von Tuberkulose bietet, die der Behandlung bedürfen, wenn nicht der Prozess fortschreiten soll, um dann immer schwerer heilbar zu sein. Selbst wenn sonst scheinbar ganz vernünftige erwachsene Leute wegen Initialerscheinungen ärztliche Hilfe in Anspruch nehmen, so geschieht dies in den allermeisten Fällen nicht länger, als bis jene Symptome, die ihnen selbst aufgefallen sind, und die sie zum Arzte geführt haben, wieder geschwunden sind; verlangt aber der Arzt eine Fortsetzung der Behandlung oder der Beobachtung, so sehen sie in diesem Begehren eine allzu grosse Aengstlichkeit wenn nicht gar minder lautere Motive ihres Beraters. Und wie oft schrecken die Kosten der Behandlung von der Vornahme einer solchen ab! Die Oeffentlichkeit hat die moralische Verpflichtung, in solchen Fällen helfend einzugreifen, längst anerkannt, indem sie auf dem Wege der Privatwohltätigkeit Institutionen schuf, die den minder Bemittelten zu gute

kommen sollten; die Gemeinwesen (Städte, Länder, Staaten) sind nachgefolgt; aber so löblich und in einzelnen Fällen nutzbringend auch diese Institutionen waren und sind, sie kamen und kommen nur immer einer geringeren oder grösseren, immer aber beschränkten Anzahl Hilfsbedürftiger zu gute und an die Wurzel des Uebels reichen sie so lange nicht, als nicht alle Erkrankten in frühestem Stadium ermittelt und alle behandelt werden, bevor sie schwer heilbar oder unheilbar geworden und bevor sie Infektionsquellen für andere sind.

Eben der Umstand aber, dass jeder offen tuberkulöse Mensch eine Gefahr für eine nicht näher zu bestimmende Anzahl anderer Individuen bildet, gibt auch der Allgemeinheit das moralische Recht, aus öffentlichen Rücksichten jeden Tuberkulösen durch die Behandlung unschädlich (und dabei gesund) zu machen, ebenso wie es bei Cholera-, Pocken-, Pest- und andern Kranken durch Isolierung und Behandlung geschieht, und wenn das Recht hierzu gesetzlich statuiert wird, so ist das ein Anfangsschritt zu einer radikalen und grosszügigen Sanitätspolitik, die um so segensreicher wäre, auf ein je grösseres Gebiet der kultivierten Erde sie sich erstrecken würde.

Ein Hindernis in der Durchführung der vorgeschlagenen Grundsätze wäre wohl in deren Kosten gelegen, doch gewiss kein unüberwindliches; denn abgesehen davon, dass es wohl kaum rentablere Staatsausgaben geben kann, als solche, durch die dem Gemeinwesen und der Volkswirtschaft tausende von Arbeitskräften erhalten, zum mindesten aber für viele Jahre in ihrer Leistungsfähigkeit erhöht werden, wären die Kosten bei dem angegebenen Vorgehen gar nicht so ausserordentlich hohe und könnten manche Beträge, die jetzt als Zuschüsse für die Unterbringung bereits ernstlich Erkrankter geliefert werden müssen, hier verwendet werden, um jene Erkrankungen zu vermeiden.

Compulsory Examination and Treatment in Nurseries, Schools, Orphan Asylums, etc.—(Bäumel.)

In most cases, tuberculosis begins in the first year of life.

Recommendations:

1. Thorough medical examination at least twice a year in orphan asylums, kindergartens, nurseries, and schools.

2. Uniform reports and certificates to be transmitted to other institutions to which the child will go or to be handed to the child after the end of the school year.

3. Unless the parents have done so, the institutions for the treatment of general or local tuberculosis, or such diseases as lead to tuberculosis, must care for these cases.

Examen Obligatorió en los Planteles, Escuelas, Asilos de Huérfanos, Etc. —(BÄUMEL.)

Las mas veces la tuberculosis empieza en los primeros años de vida.

Recomendación:

1. Examen medico completo é lo menos dos veces al año de los asilos de huerfanos, "kindergarten," planteles y escuelas.

2. Informenés uniformes y certificados, los cuales serán transmitidos a las otras instituciones donde va el niño, ó éstos deberán ser entregados al niño al fin del año escolar.

3. Salvo el caso que los padres lo hayan hecho, la institución deberá cuidar del tratamiento de la tuberculosis, manifestada ó local, ó de ciertas enfermedades predisponentes a la tuberculosis.

Examen obligatoire dans les crèches, écoles, torphelinats, etc.—(BÄUMEL.)

Dans la plupart des cas la tuberculose commence dans la première année de la vie.

Recommandations:

1. Examen médical attentif au moins deux fois par an dans les orphelinats, les Kindergartens, les crèches et les écoles.

2. Rapports et certificats uniformes que l'on transmettra aux autres institutions où l'enfant ira, ou que l'on remettra à l'enfant à la fin de l'année scolaire.

3. A moins que les parents ne l'aient fait eux-mêmes, les institutions doivent pourvoir au traitement de la tuberculose manifeste ou locale et des maladies qui mènent à la tuberculose.

SECTION IV.

Tuberculosis in Children—Etiology, Prevention, and Treatment (*Continued*).

FOURTH DAY. AFTERNOON SESSION.

Thursday, October 1, 1908.

HYGIENIC AND CLIMATIC PROPHYLAXIS. CARE OF THE CHILDREN OF CONSUMPTIVES.

The President, Dr. Jacobi, called the Section to order at three o'clock.

THE VALUE OF CHILDREN'S GARDENS IN CONGESTED NEIGHBORHOODS FOR THOSE CHILDREN WITH A TENDENCY TO TUBERCULOSIS OR FOR THOSE IN WHOM THE DISEASE HAS BEEN ARRESTED OR CURED.

By Mrs. Henry G. Parsons,
New York City.

There is no difference of opinion among physicians to-day as to the necessity of open-air living for children having a tendency toward tuberculosis, for those in whom the disease has been arrested or cured, or for the preservation of the health of those in whom no disease exists. Not more than 1 in 500 can be accommodated at the seaside and mountain homes, and, besides, the sea air does not agree with all children. Moreover, it is neither possible nor right for any large number of children to be separated from parental care. Therefore, we must provide open-air spaces, near their homes, where children can spend the whole day, if necessary, without anxiety to their parents.

We cannot leave the matter of health and education entirely in the hands of the scientist—we need him, but he also needs us to make the results of his research and discoveries practical utilities. After making a close study for years of churches, schools, settlements, and existing organizations, and

nowhere finding satisfaction in the results obtained or for the money and labor expended, I set myself about to find the flaw. By the expression on the children's faces I decided that they were living under conditions that home, school, and church did not reach. Most elaborate plans were laid out for the physical welfare of the child, but only in few instances were they carried out by the teacher. As I sat on the platform at the opening exercises of the schools, watching the children marching to their seats, not one in a hundred presented an appearance that would lead one to feel that they were able to endure the five hours of strain before them. Through my intimacy with the mothers of these children I gathered much information as to the causes for many physical defects in the children; for example, round shoulders and bent backs in children of eight or ten years of age. At nine in the morning, after a refreshing night's sleep, one would naturally expect a different appearance. I found, in one instance, that a girl of ten had put a half a ton of coal into the cellar the night before. It was evident that some plan must be worked out that would bring about all these corrective processes in a natural and unavoidable way, and I decided to draw a group of these children out into the open, with no other influence bearing upon them for the time being but my own.

The First Children's School Farm in New York city was planned with the idea of putting into practical operation all the discoveries that our best scientists have found to be needed for the building up of strong healthy bodies and minds in our children, and to fit into the school curriculum a branch that would unconsciously bring about these results and meet the need of the weak and the strong.

For the delicate or crippled child the ordinary playground and street is prohibitive, because of the intense activity and noise. Instead of the ordinary playground, with its glare, noise, and monotony of color, picture to your mind an ordinary city lot transformed into a garden of beauty, filled with living green things, where the children can come and go at their pleasure, with individual plots of such a size as to be easily within the limitation of their strength, so that work never becomes labor. Such a garden, within easy access of the home, affords opportunity for the mother to sit with her sewing, accompanied perhaps by several younger children, while her convalescing or delicate child grows strong and ruddy, gains a keen appetite, and sleeps well after its hours spent in the open.

The success of the First Children's School Farm in New York city, situated in a tenement and factory district at 54th Street and Eleventh Avenue, during the seven years of its existence, has been so great that parents have either come to us and begged us to take their convalescent or delicate children into the garden or else have thanked us for the strength and health gained by their children in the garden. The benefit of the garden to the mother

with a new-born infant, so often prone, at such a time, to develop tuberculosis, and whose only opportunity to obtain fresh air has been to sit on the curbstone with her baby in her lap and her feet in the gutter, is incalculable. While the rights of the children have been thoroughly protected, and this garden has been kept a veritable "children's world," its service to the convalescent mother has been enormous. The strongest link between the garden and the adult has been our little 4 x 8 foot plot of flax. Inside or outside of the fence can be seen a group of well-to-do, or perhaps utterly discouraged, Irish neighbors, husband and wife's faces lighting up with the memories of home. They tell us the whole history of the process, from soil preparation, seed planting, to the spinning and the woven cloth, and a link of confidence is established and sunshine is spread through the lives of thousands, and, after all, it is the sunshine of disposition, the happiness of laughter, that we need.

In laying out such a garden, we must keep several things in mind: The esthetic—the necessity of filling the mind with pleasant thoughts; individual ownership is an incentive to draw them to and hold them in such an attractive spot. The plan of lay-out as to width and direction of paths is far more important than one would at first realize. In the delicate or crippled child a great timidity is developed because of his physical handicap. He is constantly in fear of being injured by collision with his more active playmates. We have in the New York garden over 150 crippled children, and one notices with astonishment how their activities have been developed because of the straight long paths, which give them a feeling of protection. Here they can run at will without danger of colliding with their playmates. A little fellow of seven, who had lost his leg through an accident, seemed to cover the distance from gate to summer-house in three jumps. I met him one day with a watering-can filled with water in each hand, his crutch fastened through a loop in his trousers so that it could not fall.

Now what crime have we been committing by suppressing the muscular energy crying out for action in these crippled children? If any of you have tried to rear a delicate child, you will know that there is danger of a moral tuberculosis, or self-centered interest, spasms of violent temper, cowardice, because of the lack of the natural outlet in which the healthy child works off its surplus spirits. We also know that the intense activities indulged in through games, swings, bicycles, tennis, etc., are very apt, by their exciting interest and exhilaration, to lead the participants to indulge in them to the point of exhaustion. In the majority of our playgrounds apparatus is placed where all can use it—apparatus that, in a private gymnasium, they would be allowed to use only after at least two years of training. The broken arms we *see*, but the rupture and strain on delicate organs we know nothing of until, later in life, when we have an invalid girl or boy.

With manual work this rarely occurs, for as soon as the children become

a little tired they stop. A children's garden, properly conducted, affords work, leisure time to lie on a bench and dream—think of it, dream in the midst of the city! There is the watering; the wheeling of a wheelbarrow, just the right size, filled with vegetables, weeds, or perhaps a baby brother or sister in it; the catching of butterflies and the mounting of them; hunting for the bad and the good lady-bug; the simple lessons in hygiene taught by covering certain plants with flower-pots, or the cutting out of one's initials of cardboard and pinning them to a leaf to show the effect of shutting off the sun's rays; the delights of getting vegetables of one's own growing, cooking them in a well-equipped kitchen connected with a garden, or under a mere shelter with an oil stove; the whittling of cultivating sticks; the painting of the plot sign; not only the individual plot ownership, but the community spirit of making the whole garden beautiful by its well-kept paths and weedless flower-beds; the delight of receiving guests of high or low estate; the pride of keeping shining tools because it is *our* garden—*the neighborhood's garden.* So manual training, domestic science, physical culture, nature study, social economics have all been correlated in this first Children's School Farm in New York city, not by accident, but by a carefully thought-out plan.

Such a garden should include healthy as well as delicate children, so as to bring about a self-forgetfulness. In our garden in New York we do not allow the term "crippled children" to be used; they are our visitors, and we must extend every courtesy to them, and the healthy little farmers vie with each other in taking their helpless little guests about the garden in wheelbarrows, or assisting them in carrying water and weeding their plots—so the influence is retroactive. These children are brought by the Crippled Children's Driving Fund from all parts of New York city.

No park in a congested neighborhood should be laid out without consideration for the weak, as well as the strong, and for the needs of all ages, from the baby to the grandfather. Children's gardens should be placed in some parks, but not in all parks; on some lots it is far better to have playgrounds than gardens, and vice versâ. Many playgrounds could well afford to spare some space for a garden.

The Children's Garden in DeWitt Clinton Park was planned also to show the immense value to be derived from a limited space. In 1902, from a space 118 x 84 feet in area, accommodating 150 children, the garden has grown until now, in 1908, it occupies a space 250 x 135 feet in area, accommodating 1100 children, 150 of whom are cripples, 400 baby brothers and sisters, 500 parents of the neighborhood, and 1500 visitors; besides these, 30 schools use the garden for nature study, making a conservative estimate of about 3500 people who are benefited annually. This three-quarters of an acre of ground affords more happiness to the square inch and is more intensively cultivated than any piece of land in the world.

THE OPEN-AIR SCHOOL.

By Mrs. Anna Garlin Spencer.
New York.

The subject naturally divides itself into three parts: First, the open-air school proper, considered as an essential accompaniment of curative agencies for children and youth in incipient stages of tuberculosis. Second, open-air instruction in ordinary schools as an integral part of the regular curriculum, considered as an essential element in that upbuilding of the general health that constitutes the essential preventive of all diseases, including specifically all forms of tuberculosis and serious nervous disorders. Third, the use of vacation and holiday opportunities for life in the open, considered in relation to family conditions, and in the interest of general health, and the intelligent use of preventive and curative methods. (1) The first "fresh-air school," so called, in this country was established in Providence, R. I., in 1907-08. The origin of the experiment was as follows: At the Anti-tuberculosis Congress in Washington, D. C., the preceding winter, a physician suggested the idea of an open-air school for children from tuberculous families. Two delegates to that congress from Providence, R. I., carried the ideal suggestion home with them, and brought it before the Local League for the Suppression of Tuberculosis as a practical possibility. The way had been prepared for such an experiment in Providence by a "day camp" for children suffering from "glandular, joint, and incipient pulmonary tuberculosis," managed by two women physicians, one of them a medical inspector of the city schools, who provided the grounds of her own residence for the camp. The advantages of this day camp had been so obvious that when the league indorsed the suggestion of a regular day school for tuberculous children, the school board of the city appointed a committee of five members to consider the scheme. On the favorable report and recommendation of this committee the school board started and carried on the work at public expense. The official account says:

"An unused public building, formerly a cooking-school, was made available by cutting out nearly the whole southern brick wall, and replacing it by long windows, which were hung from the top and opened inward. Children with hip-joint disease or enlarged glands, or those at the time, or who had been in the near past, closely associated with open cases of tuberculosis, were selected for the school by district nurses and the medical inspectors.

Warm sitting-out bags were made, and provided by a sewing society of one of the churches, and all else was supplied by the city. Some very severe cold weather was experienced, but the windows always remained open; and by hot soapstones in the sitting-out bags, a hot drink at recess, and frequent trips to the stove, neither teacher nor pupils were uncomfortable." "The ages of the children ranged from seven to thirteen years, and the grades represented from one to eight." "Two sessions were held, the first from 9 A.M. to 11.45 A.M., and the second from 1.45 to 3.30 P.M. During the morning session a half-hour recess was given, in which the children played out of doors in fair weather for twenty minutes, and for the last ten minutes sat quietly in one corner of the room and drank a cup of hot soup." The windows were closed at the noon hour, and many children brought their lunch and ate it at the school. This they were encouraged to do when living at a distance. The largest number registered was twenty-five; the average attendance was not above twenty. The name of the school was carefully chosen, so as not to prejudice any of the parents against it. All special instruction in regard to tuberculosis was avoided, so as not to emphasize disease in the school, the instruction in hygiene following the regular school course. The children, however, were especially under the care of the medical inspectors of the city schools, and their condition was carefully watched, and connection was made with nurses and doctors in charge of cases of diseases at their homes.

"The eye test for tuberculosis was tried on all the children, and practically all responded." The children's weight was taken regularly as often as once in two weeks. "There was no head colds or other troubles of similar nature with which these children are ordinarily afflicted."

Although the short time in which this school has been in operation makes it still experimental, and although the fact that some of the children attending it come from homes in which poverty prevents the proper supplement to the school effort, enough seems to have been accomplished to justify high hopes for this method of dealing with children of the classes described. It gives them, for a large portion of their waking time, the right environment for their physical condition, and at the same time keeps them in line with ordinary children in their school work, thus preventing depression from either idleness or fear of "getting behind," and helping them toward a self-supporting life.

The methods of this "fresh-air school" seem not unlike those of the Waldschule of Germany, and is only modified by local conditions and the requirements of school from the general scheme of open-air treatment for incipient treatment of tuberculous troubles.*

* An account of this fresh-air school is given in the May number of the "Journal of the Outdoor Life."

A day camp school of out-of-door life has been opened recently by the Boston Association for the Relief and Control of Tuberculosis, on hospital grounds in that city. A temporary building has been erected for kitchen, storeroom, and lavatory uses. A distinctive feature of this experiment is the laying out of vegetable and flower gardens, in which the children of the day camp work, and the products of which they receive. A nurse visits the homes of all in the camp; each child receives careful physical examination, and special physical culture based upon it for the correction and development of the physique. Such a day camp has also been a feature of the anti-tuberculosis work in Providence, R. I., in connection with a large hospital, with grounds airy and spacious, which the children of the fresh-air school have attended during the summer vacation. Several similar camps are maintained in different parts of the country, including the special and extensive work in connection with the "Island Hospitals" of New York city.

There is no doubt that the day camp for tuberculous patients, adult and children, has come to stay; and the inevitable accompaniment of all curative agencies for children afflicted with any disease involving prolonged treatment is a *school* in which conditions can be adjusted to their peculiar needs, and in which all able to stand any strain of study may acquire an education while they are gaining health. Thus the fresh-air school of Providence, R. I., although a small experiment, and not under altogether ideal conditions, is a pioneer indication of what will be a growing contribution to the campaign against the white plague.

2. Experiment in the direction of specific open-air schools for those actually in need of curative measures has led directly to a more radical inquiry as to the possibility of increasing opportunities for exercise and study in the open air for all children, and in connection with the regular instruction of all schools. The example of the Providence School Board in "cutting out southern brick walls and inserting in their stead long windows hung from the tops and opening inward," and thus capable of immediately furnishing an open-air room, might well be followed by the school boards of all cities, and all country towns as well. The atrocious "heating systems," that forbid any opening of windows on pain of disturbing their mechanism, might thus get their quietus.

Some points connected with the subject of out-of-door air in school-rooms should be emphasized strongly. Among these is the fact that the supremely essential element in preventive work against any disease is the elevation of the standard of general health in the community. The weak person, the ill-fed person, the overtired person, succumbs most easily to the effects of improper physical surroundings, and has no power to resist the attacks of disease. The strong, well-nourished, well-developed person can withstand

infection, escape sickness, and overcome incipient disorders to a marked degree.

Mothers often say that it gives them a headache to visit school all the morning. Yet their children remain in the stale or even foul air that is generally responsible for the mother's headache, and the adult members of the family wonder why they are not robust. No one seems as yet to have invented a plan for freshening the air in which a large number of people live and work, equal in good effect to opening a wide window space and letting a rush of pure, unused air into the room so occupied. Many are coming to see that the school-rooms must be made more healthful in this respect for children, or the appetite will suffer, the power of properly absorbing nourishment fail, the strength to resist disease germs be lacking, and the bone-making and the muscle-making power of the organism decrease, and consequent nervous dirorders ensue. Therefore that essential preventive of all disease we call "general health" demands more fresh air in the regular schools.

There should be at least one side wall in each school-room made up chiefly of glass doors. These should be opened wide as often as once every hour, during a ten-minute singing, marching, and light gymnastic exercise, in which rapid movement, in really fresh air, can give life and animation. After such an "air-bath," teacher and pupil could settle to another hour of work with less resulting headache than is now the rule in school activity.

Next, a general education of the parents and teachers should be begun, leading toward the opening of the side walls of such school-rooms for all school work which may be safely and effectively done in the open. For instance, manual training, with its activities, including the use of the stove in domestic science work, all singing practice that allows of body motion, and many elements of physical science, might well be pursued in a room open, at least on one side, to the out-of-doors. If extra wraps are needed, they should be used. Moreover, all physical training with apparatus should be given in the open air, or as near it as can be managed. It is not merely a "cool room for exercise" that is needed, but a place in which, at every inhalation, made deep and strong by the exercise, there may be absorbed really fresh air. Where there is sufficient land, a gymnasium with at least two walls that can be annihilated by opening windows, should be the rule. In the crowded cities, Dr. Gulick's suggestion of many tiers of roofs for playground and physical culture use, rising above the school-rooms, should be adopted.

Again, enlightened pedagogy and the upbuilding of the general health of school-children alike demand the "school excursion" and the "outdoor nature study." The school excursion, as developed in Germany, would apparently need serious modification before it could become an adjunct to our American public schools. The best schools, private and public, how-

ever, in the United States now use the school excursion freely for teaching geography, history, physical science, and the habits, activities, and conditions of contemporaneous human life. The extension of this form of instruction may lead to longer school days, each of which will contain, when the weather permits, an hour or more of "walking lessons," in which children and teacher shall be called outward in thought and activity and learn, as the traveler learns, by observation and interchange of thought, as they walk and talk together.

Another aid to the importation of fresh air into education is the movement toward "school gardens," and the introduction of agriculture and horticulture into the school curriculum. Oklahoma requires such instruction in its public school system, doubtless with a view to vocational use of the training thus received. Anything, however, that emphasizes the out-of-door employments and introduces the child to the delightful companionship of "green things growing" leads inevitably to more healthful life. The use of vacant lots for such gardens, the effort to secure small parks around every school-house, the extension of the kindergarten flower-beds up through the grades, even where they must be window-boxes for want of outdoor space—all these things tend mightily toward enlarging the educational field on the side of health.

3. The third and last division of the subject embraces the use of vacation and holiday opportunities for life in the open air, considered in relation to hygienic methods of family living, and in the interest of general health and of intelligent use of preventive and curative measures.

Summer vacation camps for boys and for girls are now fashionable, but, as has been said, "only the very rich or the very poor can afford them." For the poor, who accept the fresh-air charities, we can only urge that more attention than is common be paid to the physical condition of each child, and that the country week or fortnight allotted them be used more often than is now done as a means of inculcating health-giving habits. In the larger portion of the United States a pressing need that is beginning to be met, but in a wholly inadequate manner, is for the summer camp life for the whole family. It should be provided near enough to the work-places of the bread-winners to admit of travel back and forth each day, or at least once a week, and while not a charity, its benefits should be obtainable at terms within the means of people of small incomes. The great middle class of the United States, working in cities, including many persons in the professional ranks, cannot afford two homes; cannot accept any summer outing for their children in which they do not share, unless they can choose their children's comrades; must themselves have refined surroundings in the country or stay at home. Such people often suffer, more than those less fastidious as to companionship, in the cramped quarters of city homes, in

the torrid heat of our summers, and their children keep their "better manners and morals" at the expense of their physical health, during the long vacation when the children of the tenements "live on the streets."

The Chautauquas of the country have led in the development of out-of-door life for families, combined with refined and congenial companionship, lessons for the children in nature, art, science, music, dancing, etc.—in the combination of school and camp on a basis of small expense. This movement means as much for the general health as for the educational and higher social life. It is, however, wholly inadequate to the need, not only because too limited in extent, but also because too far removed, as a rule, in its operations from the great cities, for the majority of families of the sort described to take advantage of its benefits.

Two instances may be named of rather haphazard provisions for family camping that hint at what might be done along this line. On Pelham Bay, in a city park of New York city, a place swept by salt breezes, hundreds of tents are erected and occupied every summer. The lots, 25 by 100 feet, are loaned by the park commissioner free to suitable persons. On these the people put up and remove their own tents. The city water is conveniently at hand, supplied from hydrants at short distances from one another on the tent-village street. Sanitary arrangements are intended to be first class, but some criticism might be made in regard to toilet accommodations. All seems to be neat and well cared for in the camps, and a good class of wage-earning people evidently take advantage of this opportunity for out-of-door life, with bathing, boating, fishing, and walks in park reservations at hand.

The city of Newark, N. J., owns and operates a farm of eleven and one-half acres near Avon-by-the-sea, for the benefit of children primarily, but also including many mothers and a few fathers in its out-of-door opportunity. Two kindergartners and a physician aid gratuitously in caring for the children, and an attendance officer from the Board of Education is detailed for service at the farm; a trained nurse is sent for the season from the Board of Health, and a volunteer committee do the large amount of executive work entailed.

These are but suggestive hints of what should be attempted in specific, well-directed plans for easy access to the country by families of moderate means. Something more refined in its opportunity and giving chance for more family privacy than the Pelham Bay Camp affords is needed. Something more extended and giving better opportunity for the whole family to live together in the country through the summer than the New Jersey Camp offers is required. Small, simple, inexpensive wooden cottages, such as those so common at shore resorts, like Martha's Vineyard, Mass., erected by the municipality on its own land, and rented at a merely nominal sum,

covering the interest on cost of the cottage, but not of the land—these might form the right basis for the ideal family camp near large cities. The establishment and maintenance of a first-class vacation school and recreation center for the children of these families at public expense; the detailing of trained nurses, physicians, and all proper officers of boards of health and of education to make and keep the camp a model in regard to health, order, quiet, pleasant associations, and proper amusements; the prohibition of all "concessions" for amusements of the commercial sort, and for all stores except those needed to supply the table and the ordinary household needs of the family; the encouragement in all possible ways, possibly by a volunteer agency, of festivals and musical and other entertainments of a high character—all these things are possible and should be immediately attempted as soon as family camps can be established.

To sum up: First, open-air schools must be provided in abundance, as accompaniments of all curative agencies for children afflicted with any form of tuberculosis or similar wasting disease necessitating prolonged treatment.

Second, since improving the general health of all the people constitutes an essential of permanent control or prevention of all diseases, and since some measure of open-air life is an essential element of such bettering of general health, the education of all children should be connected more than it is at present with out-of-door activities and pleasures.

Third, since the health of fathers and mothers, as well as that of children, is an essential part of preventive work against disease, and since family life determines largely the health conditions of both the present and the coming generations, one great social need is for more and easier access to country life for families of restricted means, who live and work in the cities. Hence "family camps," with public schools, organized and supervised playgrounds, health and police municipal inspection and control, medical attendance, and the offices of trained nurses should be established each summer by municipalities or private enterprise on such terms as to meet this need. The outer rim of the park systems of some cities might so be utilized, vacant lots be secured for this purpose, and outlying districts of growing cities withheld from speculators' monopoly for this benefit of the people.

Above all, since the most effective ameliorative treatment of those infected with disease is, from a social point of view, but "locking the stable door after the horse is stolen," great emphasis in the white plague campaign should be placed on a better chance for healthful family living for the multitude of city workers of limited means.

RELATION OF TUBERCULOSIS TO PARKS AND PLAYGROUNDS.

By Howard Bradstreet,
Secretary, Parks and Playgrounds Association of New York City.

The movement for the acquisition and development of parks by the municipality has had its rise and great extension almost completely since 1850. Parks and commons existed, indeed, prior to that date, as the plans of many cities testify. But the administration of a system of parks as a large and important factor in the city government is a recent phase of municipal activity. As a result of the growing appreciation of the beauties of nature, of the desire for city adornment, and of friendly civic rivalry, each of the 154 American cities of over 30,000 inhabitants reports in 1905 a park area ranging from a single acre to the 6979 acres of New York city.

The word "park" is a vague term, of varying significance, blanketing with equal readiness such immense tracts as Fairmount Park, the modest-sized ornamental squares, and the gores and triangles remnant from the cutting of new streets. Of whatever size or function, the term park implies, by tradition, the element of beauty and adornment rather than that of utility, and appeal to pride in the city beautiful secures the funds for park extension.

This same half-century has witnessed the creation of other new departments of municipal activity and the transformation of old ones. The establishment of the germ theory of disease has given a new importance to the disposal of garbage and sewage, to the necessity for pure water and milk, for the need of flushed streets, and even the extermination of the mosquito has assumed an entirely new aspect. At the touch of medical science subjects hitherto lowly have been dignified to first rank. It has at once made possible and compelled a much greater activity in many city departments.

The discoveries relating to tuberculosis are of value to the advocates of parks and to the park department—

1. *By giving a new basis for their advocacy.* The horror of a large city solidly built can be appreciated only by those who are compelled to pass a summer on its treeless streets, while the menace to health, and the barren-

ness of actual living conditions, can be known only to those whose professions take them into the tenements, or who treat directly with the tenement product. But the appeal for parks on the grounds of sentiment, comfort, and common humanity is now transformed by science into a demand that there be open spaces for conserving the life of the people.

The nature of tuberculosis has at last been established, and the conditions that lead to its development and to its extinction are now understood. Sunshine and fresh air are shown to be as essential to freedom from the disease and as necessary for its cure as pure water and milk are essential to freedom from typhoid. There were many advocates of a pure water-supply, of cleanliness in street, house, and person, before the germ theory of disease was established. But it was not until the scientists had learned, and the people had been taught, the reasons for such action that money and effort were spent without stint to obtain results along these lines.

For the prevention of typhoid, ready acquiescence is given to the spending of limitless sums. When once the lesson of the educational campaign regarding tuberculosis has been learned, the same acquiescence will be given to expenditures securing adequate light and pure air. Whether established from a motive of civic beauty, of civic rivalry, of sentiment, or of reason, parks furnish these essentials, and, therefore, the foes of tuberculosis look to the parks for supplies of war, and regard them as an active ally in their campaign.

Thus medical science stimulates and dignifies the work of still another city department.

2. A service is rendered the park movement by laying emphasis upon the need for *numerous small neighborhood parks*, rather than upon the large reservation or excursion park.

Tuberculosis finds its readiest triumphs among the overworked and underfed. If parks and playgrounds are to help turn these triumphs of disease into defeats, they must be placed strategically in largest number, giving freest opportunity for use among that class of citizens.

A large reservation that is little used by the people may exist within the limits of a very closely built city, and so be a small factor in the life of the citizen. The test of the value of the park is in the number of its daily visitors, not in its area.

Many students of the city life from time to time have advocated the value of small parks and urged their acquisition, on the basis of health, but there has not yet been established, among people or authorities, the sense of necessity that would lead to effective action.

The tuberculosis campaign, by its educational work, gives promise of such results.

3. The tuberculosis campaign gives its most valuable suggestion to the

parks in urging upon them a *larger meaning* and a more *aggressive policy* of administration.

In the case of many measures taken by the city for the common welfare the benefits are bestowed automatically. It is quite impossible for a citizen not to profit by pure water provided, or to benefit from the sewer system or the wholesome effects of clean streets, but such is not the case with the fresh air and sunlight furnished by parks.

An apartment may face a park and contain dark rooms, or the occupants may keep the windows closed and leave the rooms but little, and thus neglect the opportunities placed at their doors. It does not necessarily follow that a park, any more than a library, will serve the welfare of those most needing its services. Indeed, in both cases the first patrons will be those who have instincts in such directions to gratify, and not the ones in whom the instinct is yet to be aroused. This fact is considered in the conduct of libraries, where it is found as necessary to stimulate as to gratify a desire for reading. The same fact is also noted in the recent growth of the playground movement. It has been found by experience that it is not enough to furnish apparatus, but there must also be a personality to organize and stimulate the children in order to bring the largest returns in attendance and healthful activities. Park concerts are commonly conducted in American cities, and serve well as an attraction for the older people, and act as an inducement to profit by the fresh air.

A park, in order to achieve its purpose of encouraging life out of doors, must adapt itself to its neighborhood. In a fine residence section, where porches or ample cool rooms exist, the function of a small park is not the same as in a tenement section. While beauty is always desirable, and the fine effect of a green sward in a crowded district, is undisputed, nevertheless to dedicate one or two acres to sanctified grass, while the people must sit on the sidewalk beside its edge, is to secure but a small return of usefulness in proportion to the possibilities of the space. In many sections, during the hot weather, eating out of doors in the neighborhood park could be encouraged to advantage, disturbing as the thought might be to a conventional park director.

Still another use of park property suggested by the tuberculosis propaganda is in family tent life. There are large reservations in many cities, usually at a distance and on some waterway or height of peculiarly healthy nature, whose use, by reason of distance, is confined to occasional excursions. A workman threatened with tuberculosis is directed to live out of doors, and in obeying the injunction is threatened with probable loss of work. Were it possible for him to do so at the right moment for sufficient time, the city would be spared the loss involved in his breakdown later. The reservation or excursion park could be of value at this point by setting aside

certain available stretches equipped with tents for family life under most favorable health conditions.

In many cities the Board of Health already provides camps for the treatment of tuberculosis. The suggestion that the jurisdiction of the park board might be extended so as to deal with an allied work, illustrates the inevitable identity of interests in city departments when dealing with the personal welfare of the citizen. In so far as the park board deals with trees and soil, the school board with books and laboratories, the health board with diseases and their prevention, each has a distinct field for expert action of widely differing natures. But in all there is a border territory that compels the interest of the health authorities in school and park affairs, and that makes the parks interested in schools and health, and in this domain medical science is leader and director.

Finally, the park problem as related to tuberculosis becomes allied with the housing problem and town planning. Just as neighborhood parks have a larger significance, when properly used, than large and ornamental reservations, so does a city block in which the park element is furnished in itself possess a greater value than the small park. Under the conditions prevailing in the large cities at present it is not only possible, but it is the custom, to build solidly a succession of blocks with no provision for the intimate park element. When its need becomes imperative, financial limitations in the value of the property to be acquired make only a minimum number of open spaces possible. Such a plan not only is baneful in itself, but tends to destroy the instinct for out-of-door life and the desire for exercise, a loss that has far-reaching and incalculable results. Already the substitution of excitement for recreation is found, and the parks are placed in unequal competition with amusement resorts, either outdoors or indoors, furnishing nerve stimulation rather than restful enjoyment. This perversion is part of the human adaptation to urban conditions—an adaptation that, in the end, will be far more expensive to society than the providing of the means for enjoyment of nature, expensive as that process may be.

In so far as the movement against tuberculosis urges outdoor life, sun, and pure air, in so far does it stand for parks and playgrounds for young and old, so placed as to give greatest resources to the greatest number, and secured not from motives of sentiment, but from the most fundamental and compelling that can advocate any cause—the preservation of the health of the present and of future generations.

THE HYGIENIC AND CLIMATIC PROPHYLAXIS OF TUBERCULOSIS IN CHILDHOOD.

By Frederick L. Wachenheim, A.B., M.D.,
New York.

The higher aims of medical science seek prevention rather than cure. In combating tuberculosis, which so often begins in infancy, blights the fair promise of childhood and adolescence, usually terminates in premature death, and imposes a tremendous economic burden upon the community, our energies must needs turn to an efficient prophylaxis. As our knowledge of the etiology and pathology of tuberculosis has increased, it has become more and more evident that this prophylaxis must be begun early—in infancy and childhood. The subject of the prevention of tuberculosis, in its entirety, is far too vast for discussion here; for this reason, only such matters as relate to personal hygiene, including the general regimen of life and the choice of residence, the last considered essentially as regards the elements of climate, will be dealt with in this article.

Good general nutrition has always been considered as one of the best preventives against tuberculosis. This is so far true that a loss of weight invariably accompanies a progressive state of this disease, but is not, of course, true of the converse. It is also a common fallacy, especially in our sanatoriums, to consider an increase in weight a sign of improvement, whereas it is no difficult matter to fatten any patient who is not rapidly or at least progressively going down hill, by enforcing a quiet life and supplying an ample dietary. Nevertheless, we may regard a reasonable amount of adipose tissue as an indication of some individual resistance to the tubercle bacillus. Children, especially, who suffer from what we term scrofulosis, thereby showing either susceptibility to tuberculosis or the presence of one of its chronic forms, regularly improve if a gain in weight can be effected.

Our greatest difficulty is with children who suffer from anorexia, which may be a sign that tuberculosis is already established, for, on the other hand, may be merely the manifestation of a neurosis or a perverted metabolism, or be due to vicious habits of eating or to dental caries. In these cases we must begin by correcting any causative factors that may be present, paying particular attention to the candy and caffein habits and to painful teeth.

Neurotic children must not be permitted to associate with older or overstrenuous companions, and should be guarded against nervous excitement. A sufficient amount of restful sleep should also be procured. Overwork at school is uncommon nowadays, but too many children remain at home reading when they should be out of doors. An outdoor life may sometimes be secured most readily by moving from the city to the suburbs, to a milder and sunnier climate, or to the more bracing conditions at the seaside or in the mountains; this will be discussed more fully further on. The chronic constipation that regularly accompanies the anorexia of children is usually only concomitant, but may sometimes call for special treatment.

The diet of children should be as varied as possible, excluding highly seasoned foods and stimulants of all kinds, including tea and coffee. Eggs and cereals, bread, and plenty of good butter and milk should form the basis of the three or four daily meals; meat should be given only once a day to young children, and not more than twice, even at puberty. Treatment with fats, especially the distasteful cod-liver oil, is not regarded so highly as it formerly was. I have already explained that mere fatness is not necessarily a sign of robustness. Nevertheless, cream and butter, in moderate quantity, are usually relished by children, and a few learn to enjoy a reasonable amount of pure olive oil; these fats are all relatively digestible and free from the disgusting odor and taste of cod-liver oil. The latter is said to be becoming scarce, and other and still more unpleasant fish oils are not infrequently substituted for it. In any case we must remember that fats are useful, especially during the colder months, since they possess calorie value in its most concentrated form.

The carbohydrates may be given freely, and I do not share the common prejudice against sugar, which is, after all, but the equivalent of an equal weight of starch. The only objection to large amounts of cane-sugar is that they develop the candy habit, which is pernicious because of the inferior quality of sweets usually purchased, and because of the secondary development of the chocolate habit, which is merely a variation of the reliance on coffee or tea as a stimulant. Excessive fondness for sugar must be combated by withholding that article of food until the child learns to do without it, or by narrowly restricting its quantity. The oxybutyric acidosis, so often observed in children, is probably not caused by the excessive ingestion of carbohydrates. Since we know that this intoxication, in diabetics, is due to a too strict withdrawal of carbohydrates and an excess of fat and albumin in the diet, we may safely conclude that in children, also, this affection is the result of an excess of fatty or proteid, and not of carbohydrate, food.

Nothing is so useful to stimulate the appetite of children as exercise, if care be taken not to push it to the point of exhaustion, for when this is done the digestive apparatus will inevitably suffer. Exercise, including system-

atic gymnastics, is also in high repute as a prophylactic measure against the development of tuberculosis, but it is as well to subject this purely empirical view to scientific revision. A good muscular development is, without doubt, a useful personal asset to one whose vocation in later life calls for great physical strength. Otherwise, the assiduous cultivation of gigantic muscles, which is quite possible to any one under scientific management, has little permanent value, for when heavy work is discontinued, the painfully acquired hypertrophy disappears rapidly. It is not too much to say that this sort of gymnastics is a sheer waste of time, and I may go even further, and pointing out that physical overexertion, especially if long continued, is one of the immediate causes of premature arteriosclerosis, and is likely to be associated with, at least, periodic albuminuria. It may be argued that this phase of the subject hardly concerns us here. What is more to the point is that careful observation seems to show an increased susceptibility to tuberculosis among record-holding school and college athletes*; it is evident that the exhaustion following their strenuous competitions favors the invasion of disease; and athletics of this type should absolutely be forbidden to school-children. It is, therefore, to be regretted that efforts are now actively under way to foster interscholastic contests; for they are unquestionably harmful physically, and seem to be even more pernicious morally if we may judge from recent developments in so-called amateur sporting circles. It seems to me that our higher institutions are acting wisely in trying to limit the field of competitive athletics; and it is to be regretted that the secondary schools are endeavoring to extend it.

Personally, I have no hesitation in declaring that I see no value in athletics save for the outdoor life they involve; from this point of view the less strenuous games, especially those in which the vain desire to break records plays no part, are to be preferred to mere feats of strength, speed, and endurance. We can safely favor such sports as tennis and baseball, which train the eye and brain as well as the muscles, which may be discontinued when the child becomes tired, and whose rules set a time limit of a few hours. Indoor games and gymnastics are far inferior, and are to be resorted to only for special purposes, as when stormy weather interferes with life out of doors. In winter, snow and ice afford opportunities for wholesome sport that cannot be replaced by the best gymnastic apparatus. In orthopedic practice it is regularly found that gymnastic exercises are most needed by children who have lived indoors too much; those who have led an active outdoor life have no occasion to resort to dumb-bells or Indian clubs. I may be criticized for having treated exercise merely as a means of hardening, and I accept the criticism cheerfully. If we fortify the physique against that arch-enemy of early life, tuberculosis, we give the brain a chance to win for its

* I. Coughlin: Med. Record, June 2, 1906.

owner a position in the world to which mere muscle will hardly serve to raise him.

The process of "hardening," has long been, and still is, regarded as our mainstay in combating a tendency to tuberculous infection, or as an aid in resisting the further inroads of an infection already acquired, but for the time being latent or quiescent. It is much to be regretted that the recent brilliant investigations bearing on the doctrine of immunity, with all their absorbing interest and eventual possibilities, as yet throw no light on the merits of hardening as a therapeutic method. Nevertheless, its value in the treatment of established and evident tuberculosis has been placed beyond question, and, despite its empirical status, it will remain for the present our most valuable prophylactic agent. To attempt an exact definition of the term hardening merely begs the question. The degree of hardening sought has hitherto varied according to the mental attitude of the individual clinician, for the physiological data, that should aid us in reducing this procedure to some sort of system are lamentably incomplete.

The theory of catching cold is one of the most actively mooted points of pathology, even if we define a cold as an acute infection of the respiratory tract. Many utterly deny that a sudden chilling of the body can cause a cold, only a few accept the exposure etiology in toto, and most of us handle it with reservation as not proved. Although an advocate of this view, I admit that the evidence in its favor is very inconclusive. Furthermore, the question as to whether a cold predisposes to tuberculous infection is quite unsettled, but I believe that the invasion of the tubercle bacillus is undoubtedly favored by a previous infection of the respiratory tract, as happens, for example, after an attack of measles. Moreover, the amount of protection that hardening affords against acute respiratory disease is still in dispute, and the same may be said concerning the degree of hardening that should yield the best results. Hecker * has indeed proved that excessive hardening predisposes to colds, but no one has furnished really satisfactory evidence that moderate hardening assists the organism in acquiring even relative immunity. As to this last point, we are still on an entirely empirical basis; all that we know is that experience shows moderate hardening to be a means of defense against tuberculosis, and excessive hardening, so called, to be no hardening at all, but a most effective method of lowering the general resistance to infection of the respiratory tract with the organisms that cause acute inflammation, and probably tuberculosis as well.

It is evident that we cannot draw the line between reasonable and excessive measures of hardening arbitrarily, nor can any sweeping rule be laid down to guide us, unless we depart from our standpoint of conservatism. Our object should be to start with a minimum, and to work up to a higher

* Münch. med. Woch., 1902, No. 45.

degree gradually, taking care to keep within the range of tolerance of the particular individual before us. We may, however, regard two points as settled: first, that the patient most urgently requiring hardening should be handled with especial gentleness at the outset; secondly, that hardening should be less and less strenuous as approach or recede from the age of thirty or forty years, so that infancy and old age should be subjected to the mildest measures only. These two principles depend on the well-known physiological fact that the efficiency of the thermoregulatory apparatus of the body varies according to age and individual robustness: to reduce them to a practical basis, it will be necessary to adopt the working formula which, on a previous occasion,* I have designated the theory of the indifferent temperature.

By the term "indifferent temperature" we may designate that atmospheric warmth at which the thermoregulatory apparatus of the body is at rest, the animal heat being maintained by the minimum normal respiratory activity alone. Both heat and cold act as stimulants, though in different ways. Heat can be counteracted only by the vasodilator apparatus; this, naturally, becomes exhausted in the course of time, producing the condition called enervation. Cold may be combated either through the vasoconstrictor mechanism or through muscular exertion, of which the latter may be controlled voluntarily; in addition, we have the auxiliary means of clothing and artificial heat, so that our physiological resources need not be overtaxed. To demonstrate that, properly regulated, either heat or cold may be employed as a tonic, I need only refer to the Japanese custom of hot bathing; it seems, indeed, as if their method were preferable in some ways to our cold baths, for it involves no risk of chilling the overheated body surface. As to the ultimate hardening result, the Japanese laborer certainly leaves nothing to be desired in that respect.

The hot bath is, however, the only means of employing heat as a hardening method that can be regulated; for general use the employment of cold is far more available, since our climate supplies sufficiently cool air during the greater part of the year, so that mere life out of doors may be effectively utilized. Cold water is quite readily obtainable at all seasons. It is for these reasons, perhaps, that European and American methods of hardening resort to the application of cold exclusively.

We are now, fortunately, I think, entering on a period of reaction from the mania for violent hardening which existed a few years ago, when the most popular measures amounted to positive cruelty. I need only recall that young children, even infants, preferably those that appeared delicate, were plunged into cold water two or three times a day, and that nudity, to the limit of the law, was regarded with favor. Going about barefoot indoors

* "Climatic Treatment of Children," p. 7.

at all seasons, with as little clothing on the extremities as possible out of doors in summer, are still widely advocated, the great object evidently being to keep the child uncomfortably cold all the time. In spite of the absurd extremes mentioned, however, the general principles of hardening still hold good, provided the measures applied are kept within rational bounds. I may, therefore, at this point give a brief outline of such methods as seem to me reasonable and adequate, neither pampering and enervating the children, nor, on the other hand, exposing them to unnecessary discomfort and risk.

Children should, of course, be out of doors as much as possible: this sounds axiomatic, but is not so easy to carry out in the more congested city wards, especially among the poor, where the mother's manifold household duties keep her and her family at home nearly all day. Thus I see many instances where promising infants gradually fall below normal, merely because they are taken out only once or twice a week, even in pleasant weather. In this connection we may note with interest the observations of Hansemann,* which I have been abundantly able to verify. Without ignoring the harmful effects of artificial feeding, he attributes rickets chiefly to what he aptly calls imperfect domestication; in other words, he considers man still imperfectly adapted to an indoor life, and regards that form of malnutrition which we call rachitis as due to insufficient fresh air and sunlight. I might add that many obscure forms of anemia are also unquestionably caused by living in the semidarkness of many of our city rooms. Similar conditions once were common in prisons, and may still be observed in miners. It seems that children, as well as plants and most of the lower animals, thrive to perfection only out of doors. It also seems that these rachitic and anemic children are more susceptible to tuberculosis than those that are more robust; it is certain that many of them acquire a chronic or a latent tuberculous infection in very early life, as we cannot otherwise account for the relative frequency of glandular enlargements in this group.

During the first month of infancy the thermoregulatory apparatus of the body still functionates very imperfectly, so that exposure to cold easily reduces the temperature to the subnormal. This condition has been shown by experience, even more than by experiment, to favor the development of acute respiratory or gastro-intestinal disease. New-born infants must, therefore, be kept indoors; an outing may, however, be permitted in the third or fourth week in midsummer weather. After the first month of life, the baby's first outing depends on the season of the year. It is well to remember that the first airing should be taken when the temperature is at least 70° F. (21° C.) and during calm and sunny weather. Later on, of course, a lower temperature will suffice, but it is evident that a baby, born at the

* Berlin. klin. Woch., February 26, 1906.

beginning of the winter, may have to be kept indoors for months if its native climate be cold or damp.

Toward the end of the first year low temperatures may be largely disregarded; our very cold days—I am speaking of the middle Atlantic coast—are nearly always sunny, though sometimes windy, so that the infant may be stationed on the sunlit eastern or southern side of a building during the forenoon, thereby being sheltered from our keen northwest winds. Under these conditions a temperature well below the freezing-point is easily borne. I have seen infants in their second half-year, well bundled up, basking in the sun on some of our most severe days, in evident comfort. The rule, occasionally laid down, to keep infants indoors when the temperature falls below 20° F. (—7° C.) need not be so strictly adhered to; it practically involves imprisonment far northward, but exposure to relatively severe cold in the south. We must not forget that 40° F. (4° C.) seems as cold at New Orleans as zero (—18° C.) at Montreal, because the normal winter temperatures are respectively 15° F. (8° C.) higher. Sensitiveness to cold is largely a relative matter, depending on what we have become habituated to. It is a case where sound judgment will be a better guide than any formulated rule.

After the age of two years, mere cold may be disregarded altogether, whereas dampness and high winds are still harmful. As the school age is approached children should be kept at home only when it rains, a dry and cold snow-storm being relatively unobjectionable.

In this connection I must animadvert briefly on the so-called house-airing, frequently recommended to timid parents as a substitute for outdoor life; as a matter of fact, it is not even a poor imitation thereof, but, on the contrary, a measure replete with danger. I need only recall that the child is exposed to a cold draft at every inadvertent opening of the door, conditions that do not obtain on a veranda or in an open tent, where there are no considerable contrasts of temperature and the air-currents are diffused. I must also add a few words of condemnation of the solarium, referring only to its close resemblance to the gardener's hot-house; hardening may often become irrationally excessive, but hot-house treatment is absolutely indefensible in dealing with healthy children.

When the child's native climate, in combination with individual lack of robustness, prevents the enjoyment of any great measure of outdoor life, a change of air is indicated. As we rarely need to resort to climatic hardening in the first few months of life, the very warm resorts do not greatly concern us. Infants past the age of three months do not require an afternoon temperature averaging more than 65° F. (18° C.), corresponding to that of Boston or New York in May; this figure may be obtained in midwinter in northern Florida, southern California, the lowlands of Arizona, and Egypt. Children who are beginning to run about do better at a temperature some

10° F. (6° C.) lower, for there is no method of hardening that can compare with exposure to a moderately bracing climate; the conditions just stated are obtainable in winter in the Carolina lowlands, northern Georgia, middle California, southern Italy, and the Riviera. All these regions afford ideal conditions for young infants in early spring, for it is inadvisable to take a baby that has wintered in the south to such a climate as Cincinnati or Philadelphia before the middle of April, or to Chicago or Boston before May —the change from warm sunshine to chilly dampness involves great risk. All the districts so far mentioned have from 50 to 70 per cent. of sunshine during the winter months, much irregularity of temperature in the southeastern States, a great difference between day and night temperature in Arizona and Egypt, but remarkably even thermometric conditions in California and southern Europe.

Similar temperatures would be desirable in summer, but there are no really bracing conditions, readily accessible, on our side of the Atlantic, except on the north Pacific coast, where fogs and very high and damp winds prevail, and in the Canadian Rocky Mountains. For very young infants the middle Atlantic coast, the lowlands of interior New York and New England, the Lake region, and the south California coast are sufficiently cool. After the first summer the New England coast, the northern Alleghanies, the cooler Rocky Mountain points, and the most northerly stations on the Great Lakes are far preferable. Really cool summer days, averaging well below 70° F. (21° C.) in the afternoon, must be sought in the mountains of central Europe and on the British Isles; the American continent has nothing in this line to offer save what has been mentioned at the commencement of this paragraph.

At the risk of becoming wearisome I must repeat that we have been very remiss in not paying more attention to the value of change of climate as a means of hardening young children. Exposure to a moderately low, and therefore bracing, temperature is probably the best tonic at our disposal. It will be observed that I am saying nothing about the subarctic winter climate of the Adirondack Mountains and similar regions. I omit them because I am convinced that such extreme methods are certainly not required for prophylaxis against tuberculosis, although they are occasionally useful in the treatment of this disease in older children. In these very severe climates young children are kept indoors too much of the time by intense cold and heavy snow-storms, and, unless assiduous care is taken, or even in spite of it, the continuous battle with very low temperatures does young subjects more harm than good. At these early ages better results are undoubtedly to be obtained in such regions as North Carolina, Colorado, or New Mexico.

The second method of hardening children, usually, but undeservedly, regarded as the best, is the bath in its various forms. I regard bathing as somewhat inferior to climatic hardening in that its applicability is more

limited, and because its proper management requires far more skill and care; wisely used, however, its usefulness cannot be disputed. We are passing the period when cold bathing was advocated for all ages, including infancy; nevertheless, I think that this form of hardening, like that of exposure to the weather may be inaugurated at quite an early period, if a modicum of common sense and caution be employed.

Hardening by means of the daily bath may be achieved somewhat as follows: The temperature of the water, 10° F. (38° C.) during the first few months, may gradually be lowered to 95° F. (35° C.) by the sixth month, and to 92° F. (33° C.) at the end of the first year. In the course of the second year the immersion at the last-mentioned temperature may be followed by a brief sponging with cooler water, the temperature of which is gradually reduced from 86° to 77° F. (30° to 25° C.).

After the age of two years resort may be had to daily cool sponging, to be carried out in the following manner. The bath-room should have a temperature of from 70° to 72° F. (21° to 22° C.), and the child should stand in water of about 92 ° F. (33° C.); it should then be sponged off rapidly with water, at the same temperature to begin with, lowering it to about 77° F. (25° C.) in the course of a minute or two, the sponging to be followed promptly by thorough drying with a rough, and preferably warmed, towel that envelops the whole body. Within a year or so the temperature of the sponging water may be reduced to 68° F. (20° C.) without harm, but lower temperatures are contraindicated, for they often seem to be injurious, even to adults. Cold immersion should be resorted to with caution, as it presupposes considerable robustness. I would strongly advise against it before the sixth year, and then begin with moderately high temperatures, reserving those near 68° F. (20° C.) for puberty and beyond.

It is not easily explained, but may be verified by any one on his own person, that cold sea or river bathing is more easily borne than cold tubbing. The probable reason is that the former is combined with a certain amount of muscular exercise, as in swimming. I must not fail to mention that the test of reaction, namely, a cutaneous hyperemia setting in after a minute or so, is as valuable a test of the wholesomeness of cool bathing in children as in adults. In infancy and the earlier years of childhood the reaction is not obtained as readily as later; its absence is an infallible sign that the bath, as given, is doing harm, and higher temperatures should be resorted to at once.

Sea-bathing is an invaluable means of hardening children, but can hardly be resorted to before the fourth or fifth year, owing partly to the child's dread of the surf, and partly on account of actual danger on coasts subject to strong breakers and currents. Another difficulty lies in the circumstance that the sea is rather cold at such resorts as have a bracing climate; regions like Long Island and New Jersey, where the temperature of the ocean is

just right, are a little too enervating for robust children beyond the age of six or eight years. Fortunately, such relatively delicate children as call for care in the administration of sea baths also require a slightly warmer atmospheric temperature. The best way to surmount the difficulty mentioned is to take the child to a rather cool climate, and shorten the time for bathing, in extreme cases substituting indoor sea-water baths for the more strenuous dips in the ocean.

When the ocean temperature is about 60° F. (16° C.), as off southern Maine, middle California, the coasts of Germany, and the English Channel, the bath should last only a minute or two. A temperature of 65° F. (18° C.), as off Massachusetts, southern California, and in the Bay of Biscay, permits an immersion of from three to five minutes. Long Island and New Jersey afford water temperatures near 70° F. (21° C.), and allow a ten-minute bath under these conditions. In the still warmer waters of the Mediterranean and Chesapeake Bay, where, however, the summer climate is far too warm even for delicate infants, the bath may last still longer. The common American custom of permitting children to stay in the water until cyanosis develops is highly reprehensible, and one of the most objectionable methods of hardening known.

Still-water baths require slightly higher temperatures, and the same is true of fresh water; in the former case the massage of the breakers is absent, and we know that friction is almost a necessary adjunct to cold bathing. As to fresh-water bathing, it is well known that a salt bath feels warmer than one in pure water at the same temperature; the saline content of sea water and its stimulation of the skin are the determining factors.

Not much can be said on the subject of clothing, for our knowledge of its hygiene is still imperfect. Some years ago wool next to the skin was deemed indispensable; at present a good many pediatricians regard it as altogether too hampering, preferring loosely woven cotton goods, such as Canton flannel and stockinet. It is well to note that some children, especially infants, have a skin so tender as to be greatly irritated by the jagged fibers of wool; the weaves of cotton just mentioned do not cause chafing. With the customary overheating of American houses, a rather light weight of clothing should be worn indoors, with heavy wraps for outdoor use in the cold months. The popular fad of dressing young children in summer so that they are seminude calls for the sternest condemnation. It is difficult to understand why this fashion has been applied to the early years alone, the very age at which the body is less sensitive to high temperatures than later on, and is most likely to suffer from exposure to low temperatures. Holt* very properly says that permitting children to run about with bare arms and legs, even in midsummer, is of questionable advantage, even in our Middle States, where the

* Holt: "Diseases of Infancy and Childhood."

day temperatures are rather high, though considerable coolness may often occur in the early morning, and, especially at the seashore, toward evening also. My opinion is that this return to the costume of barbarism has no value except to facilitate the work of biting insects. Still more absurd is the idea of permitting children to run about barefoot; the only tangible result of this practice is to expose the child to the risks of traumatism in this age of nails and broken glass; furthermore, as the conventions of our civilization call for a return to shoes and stockings in later years, the final utility of learning to go barefoot is not obvious. Habits that must eventually be abandoned are hardly worth inculcating, the more so when their acquisition involves risk to health and a good deal of discomfort.

The respective tests of excess or insufficiency of clothing are simple, sensible perspiration in the former case, cold hands and feet in the latter. If a child suffers from coldness of the extremities, the only thing to do is to increase the amount of clothing or supply artificial heat. It is a great mistake to expect the child to harden itself by fighting off chilliness through metabolic stimulation alone. Much harm may be done in this way, for prolonged exposure to low temperatures invariably results in depression of the vital functions, and the child finally becomes what we call "delicate." We must, of course, take care not to go to the opposite extreme, and dress children too warmly or overheat their apartments, as enervation is quite certain to follow. Errors in both directions are committed continually nowadays, so that we are sometimes led to wonder if parents exercise any judgment at all in this important matter. It is, at any rate, the duty of the family physician to inform himself about this matter in the case of every child under his care; he will find that the golden mean is kept in the fewest families.

Die hygienische und klimatische Prophylaxe der Tuberkulose in der Kindheit.—(WACHENHEIM.)

Gute allgemeine Ernährung ist eine der besten Schutzwachen gegen die Tuberkulose bei Kindern. Um diese zu sichern haben wir Verdauungsstörungen oder nervöse Appetitlosigkeit zu bekämpfen. Um den Appetit und die Verdauung anzuregen, ist nichts so nützlich wie körperliche Übung, vorzugsweise im Freien. Wir müssen uns erinnern, dass Überanstrengung schädlich ist und sogar prädisponirend für Tuberkulose sein kann. Es ist am besten, körperliche Übung hauptsächlich als eine Abhärtungsmethode zu betrachten, welche ebensowohl die hauptsächlichste Prophylaxe als auch Behandlung der Tuberkulose ist. In der Durchführung der Abhärtung sind wir sozusagen auf die Anwendung von Kälte beschränkt. Kalte frische Luft rangirt zuerst unter unseren Abhärtungsmassnahmen, dann kalte Bäder; beide müssen vorsichtig angewendet werden, besonders bei sehr

jungen Kindern, mit nach und nach anwachsender Stärke, wie das Kind älter wird, da Excesse in dieser Richtung auch schädlich sind. Wo das vaterländische Klima des Kindes genügenden Aufenthalt im Freien ausschliesst, soll eine mildere Gegend gesucht werden, wobei man achtgeben soll, nicht durch zu hohe Temperatur eine Nervenabspannung zu verursachen.

In Bezug auf das kalte Baden sollte damit nicht im Säuglingsalter begonnen werden. In der späteren Kindheit sind Seebäder von besonderem tonischen Werte. Die Abhärtung durch gut regulirte Kleidung befindet sich noch im Versuchsstadium; individuelle Idiosynkrasie ist noch immer unser leitende Gedanke, aber Absurditäten wie halbe Nacktheit sollten verworfen werden. Wir bestimmen bei Kindern, dass die Kleidung genügend sei, dadurch dass wir die Temperatur ihrer Extremitäten wahrnehmen, da Überhitzung zum mindesten ebenso schädlich ist als Frost.

La Profilaxis de la Tuberculosis, Higienica y Climatologica, en la Niñez. —(Wachenheim.)

Una buena nutrición general es uno de los mejores salva-guardia contra la tuberculosis en la niñez; á fin de conseguir está uno tiene á menudo necesidad de combatir los desarreglos de la digestion ó los desganos de origen neurótico. Para estimular el apetito y la digestion, nada es mas util como el ejercicio, con preferencia el ejercicio al aire libre; debe tenerse en cuenta sinembargo que, el ejercicio exesivo es dañoso y que éste aun puede predisponer á la tuberculosis; el ejercicio deberá mas bien considerarse como el mejor método de fortificacion del cuerpo que es la profilaxis soberana y también el mejor tratamiento de la tuberculosis. En la fortificación del cuerpo uno está practicamente limitado á la aplicación del frío, el aire libre frío ocupa el primer rango, entre nosotros, como uno de los mejores medios en la fortificación del cuerpo, y los baños fríos pueden considerarse como segundos en importancia, ambos sinembargo deberán aplicarse gradualmente, especialmente en la niñez, aumentandolos en proporción á la edad del niño; el exceso es dañoso. Si el clima nativo del niño previene suficiente ejercicio al aire libre, un clima mas natural deberá buscarse, teniendo cuidado de no ocasionar enervación debida a la temperatura excesiva. Con relación á los baños fríos, estos no deberán ser aplicados en la infancia, y mas tarde en la niñez los baños de mar son de un tonico valioso. La fortificación del cuerpo por médio de la regularizacion apropiada en el vestido, está todavía en un estado empírico y la idiosincrasia individual deberá conciderarse como la mejor guia en este punto, absurdidades tales como media desnudez debe condenarse, nosotros regulamos el vestido apropiado en los niños por medio de la temperatura de la extremidades, exesivo calor es á lo menos tan dañoso como el frío exesivo.

OVERCOMING THE PREDISPOSITION TO TUBERCULOSIS AND THE DANGER FROM INFECTION DURING CHILDHOOD.

By S. Adolphus Knopf, M.D.,

Professor of Phthisiotherapy at the New York Post-graduate Medical School and Hospital.

That there may occasionally be a direct bacillary transmission from the tuberculous parent to the child has been demonstrated sufficiently to permit of no further dispute. Yet the number of such cases is insignificant, compared with the frequency with which a predisposition to tuberculosis in particular, and to other diseases in general, is transmitted to the offspring of a tuberculous mother or father. That this predisposition leads so frequently to the development of a tuberculous disease can, of course, be easily accounted for by the many opportunities the child has of acquiring a post-natal infection as a result of the tuberculous environment in which it is forced to live. The exposure to infection is, of course, greatest when the mother is tuberculous.

In the second portion of this paper we will enter more fully into the details of exposure to post-natal infection during childhood. For the present we will devote our attention to overcoming the predisposition inherited from a tuberculous parent.

In what does this predisposition consist? It is a general enfeebled condition without a distinct pathological lesion, all the organs possessing perhaps less than the normal resisting power to the invasion of any disease. I believe the words "physiological poverty" will express more clearly than any others the condition of a child with a predisposition to tuberculosis and other diseases inherited from father or mother.

The child of a tuberculous mother, conceived and born while the mother is suffering with pulmonary tuberculosis in the advanced stages, has, of course, poorer chances for life and health than in those cases in which conception takes place in the incipient stage of the mother's disease. When both parents were tuberculous at the time of the conception of the child, the offspring is naturally more strongly predisposed to contracting tuberculosis. The predisposition is usually least marked in the earlier years of childhood when the mother was healthy and only the father tuberculous at the time of conception.

But whether the father or the mother is the tuberculous parent, or whether the progenitors have been in the earlier or later stages of the disease, the attempt to overcome the predisposition to tuberculosis in infancy and childhood must begin with the child in utero. The mother who fears the transmission of a tuberculous predisposition to her child must, throughout the child-bearing period, live in the best possible hygienic environment, in the purest air obtainable, and, from the earliest recognition of her condition, refrain from the use of constricting garments. She should breathe deeply and often; in fact, she should take regular breathing exercises until the desire for deep breathing becomes natural to her. The kind of breathing exercises that a pregnant woman can take without fear of harm, but which, on the contrary, will benefit her, are the following: She takes a deep inhalation, and during this act raises her shoulders, rolls them backward, and holds the breath for three or five seconds while in this position. Then she exhales while moving the shoulders forward and downward. This exercise, which she can take from three to five times every half-hour, should, of course, be practised only in pure air, preferably near the open window or out of doors.

The subject of respiratory exercises will be discussed more fully further on, but it is interesting to note here the benefit that the lungs of the mother of the future child derive from deep breathing. Under ordinary conditions we never inhale or exhale more than about 500 c.c. of air, which represents the tidal volume, or tidal air. When we inhale deeply, we are able to take in 1500 c.c. of air (complemental volume, or complemental air), and about the same amount of supplemental or reserve air can be expelled by making the expiratory exercises correspond in effort to the inspiratory exercises. It must be evident that not only the respiratory, but also the circulatory system—in fact, the whole system—must be benefited by the practice of deep breathing.

The living and the sleeping room of the pregnant woman should always be well ventilated, and at least one window should be kept open in the bedroom, even in cold weather. While it is hard to demonstrate that the fear so many people have of night air is indirectly responsible for a good deal of tuberculosis, I believe, nevertheless, this to be the case. Some people will sleep in a small bedroom, often together with several other individuals, with windows tightly closed, breathing the same air over and over again, and thus surely poisoning themselves with the toxic products of their own exhalation and that of the other sleepers.

It is difficult to write on the subject of tuberculosis of childhood without touching upon the social problem. How can the pregnant woman, obliged to labor in a factory or workshop, often until the last few hours before her confinement, carry out the hygienic instructions just given, which she should do in order to bear a child vigorous and strong, with sufficient natural re-

sisting power never to contract tuberculosis. There should be a law prohibiting work in unsanitary, dusty, and badly ventilated environments for all persons, but more particularly for women and children. The pregnant woman should be obliged to cease work in a factory or workshop two months before her confinement, and not be permitted to reënter until one month after confinement and complete restoration to health.

A typical description of such conditions, where pregnant women work until the very last moment in factories, can be found in Mr. John Spargo's book, "The Bitter Cry of the Children." Unfortunately, poverty compels them not infrequently to adopt most pitiful means to hide their condition, so that they may not be discharged. Perhaps they no not fear so much the few weeks of absence which their condition demands: what they fear most is permanent discharge—"losing the job," and then being obliged to hunt for another. But, as Mr. Spargo very tersely puts it, "The consequences are too serious alike to mother and child to justify legislative neglect."

Here is a field for the exercise of the greatest humanitarian consideration on the part of the employer, and the philanthropists who will create an institution destined to succour, during a few months after childbirth, any family depending also upon the mother's earnings, can rest assured that many a life will thereby be saved.

The newly born child is as much in need of pure air as the adult, and while in early infant life the system requires more warmth, the air the child is to breathe must be pure and free from dust and other impurities. The lying-in rooms and nursery should be well ventilated, and their temperature suitably regulated. The atmosphere in such rooms should be warm enough, but never too hot nor too dry.

As the child grows older it should gradually be accustomed to cooler air. The custom of enveloping the child's face in a thick veil when it is taken for an airing is absurd, and if veiling is used at all, it should be thin, permitting the air to have access to the face. As the child grows older it should be noted whether proper breathing through the nose occurs, or whether the nose seems to be obstructed, and breathing performed with the mouth open. It must be remembered that mouth-breathing in children is a predisposing cause to frequent colds, to bronchitis, and to similar affections, all of which, in many instances, must be considered as forerunners of consumption. Mouth-breathing in children is caused, as a rule, by growths in the throat (adenoid vegetations), and sometimes by enlarged tonsils or by polypi in the nose. Besides the deleterious influence on the child's respiratory system, adenoid vegetations may also give rise to difficulty of hearing, consequent impairment of the intellect, and even to actual deformities of the jaw. Adenoids and all other obstructions to free breathing should be promptly removed by operation.

When a child, because of its delicate constitution, is susceptible to frequent colds, so that the mother may hesitate to take it outdoors often enough, she should be told that fresh, pure air never in reality gives rise to colds, but that what is commonly known as a cold is often an infectious disease, due to a specific microörganism that fastens itself more readily on a delicate system. Such so-called susceptibility to colds may be overcome by the judicious use of cold water.

From the tenth to the twelfth month one should accustom the child gradually to cold baths. The best time to begin is after its daily warm bath. Rub the child a few times with the hands dipped in cold water, and then wipe it rapidly. Later one may begin with cold sponging, and still later with a little douche. It is absolutely necessary, when using cold water, that the reaction should follow rapidly. This reaction, as is well known, is mani-

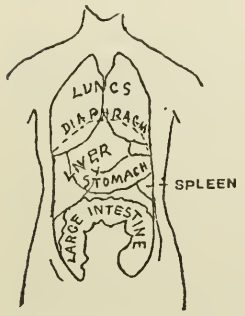


Fig. 1.—Situation of organs in chest and abdomen in a normal thorax.

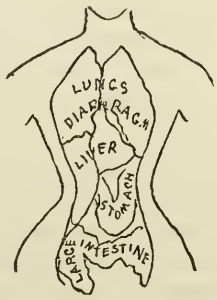


Fig. 2.—Lungs, liver, and intestines in a thorax constricted by tight lacing.

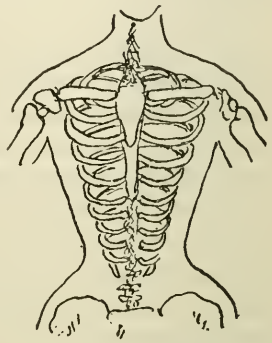


Fig. 3.—Skeleton of a chest depressed by tight lacing.

fested by a pleasant warmth perceived by the child, and externally by a reddish appearance of the skin. When cold water is applied to the skin, there occurs at first a certain whiteness or pallor, caused by contraction of the external blood-vessels. The return of the blood to the external surface produces the reddening of the skin. Whenever reaction is absent or tardy, the advice of a physician should be sought.

It is important that a child should always be properly dressed. In order that its lungs may develop to the fullest extent, no restricting garments must be worn, and this applies in particular to tight neckwear, such as constricting collars and bands. Furthermore, it must be remembered that when the neck is too closely muffled, the resisting powers to cold are lessened, and the child becomes susceptible to colds whenever a change in the atmosphere occurs.

When a girl develops into a young woman, she should be told that the

tightly laced corset is one of the most injurious garments that can be worn, not only interfering with free and natural breathing, but giving rise to indigestion and disturbances of the circulation as well. The anemia so often observed in young girls can very frequently be ascribed to this same cause, which does not permit either a free circulation or sufficient oxygenation of the blood.

The illustrations show the result of tight lacing. Fig. 1 shows the situation of the organs in chest and abdomen in a normal thorax. Fig. 2 shows lungs, liver, and intestines as they appear in a thorax constricted by

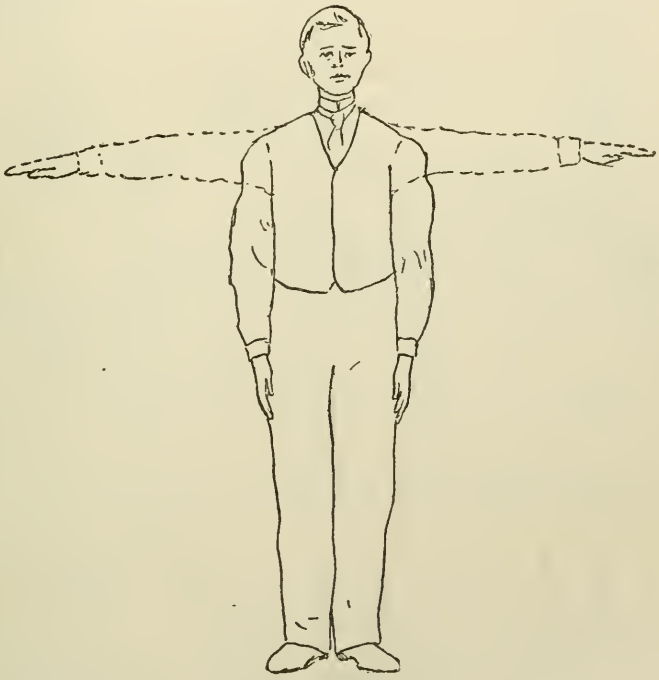


Fig. 4.—Respiratory exercise A: raising of hands to horizontal.

wearing a tightly laced corset for a number of years. Fig. 3 shows the skeleton of a chest deformed by tight lacing.

As soon as the intelligence of the growing child will permit, it should be taught to breathe deeply, and later on to take the following breathing exercises; standing in front of an open window or out of doors, the child should assume the position of military "attention," with heels together, body erect, and hands at the sides. With the mouth closed it takes a deep inspiration, breathing in all the air possible, and while doing so raises the arms to a horizontal position (Fig. 4), holding the air inhaled for from four to five

seconds, and while exhaling (breathing out), brings the arms down to the original position. The act of exhaling, or expiration, should be done a little more rapidly than the act of inspiration, the former consuming about three seconds, while the latter occupies about four. As previously stated, the air inspired should be retained for about five seconds. The child should be taught to count mentally during these three acts, so as to be systematic

Fig. 5.—Respiratory exercise B: to expand the chest laterally.

Fig. 6.—Respiratory exercise C: with hands above the head and backward movement.

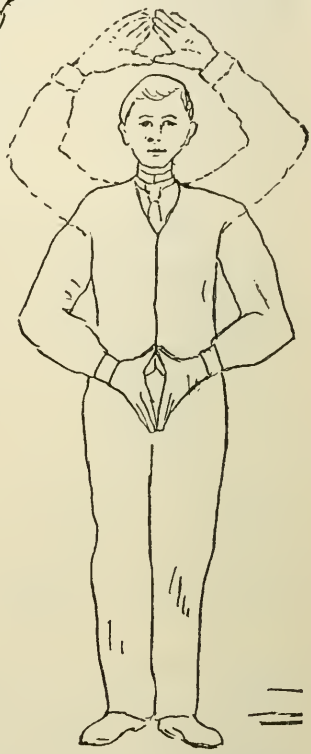


Fig. 7.—Respiratory exercise D: for combined abdominal and chest breathing.

about holding the air; one can give two upward and two downward movements of the wrist-joints, counting four, and at the fifth second lower the arms and begin to exhale.

When exercise A is thoroughly mastered, exercise B may be undertaken. The arms are placed one above the other in front of the chest, giving the hands a position as though about to tear open the chest (Fig. 5). Then hands, arms,

and shoulders make a backward movement (the fingers remaining bent), during which a deep inspiration is taken. Again counting four by tapping the chest four times with both hands, at the fifth second one starts to exhale, bringing the hands and forearms back into the position they held when starting. This exercise has the advantage that it can be taken in the sitting position or even when lying down on the back.

The third exercise, C, consists in raising the arms from the sides to the horizontal and then above the head (Fig. 6), taking a deep inspiration during this act, then bending backward as far as one can, and remaining in that position for four seconds while retaining the air, counting the seconds by moving the hands alternately, twice forward and twice backward, and at the fifth second exhaling gradually while resuming the original position. During this exercise it should be borne in mind that when the arms are raised until the hands join, one should not bring the arms close to the head, but rather form a circle above the head by bending the arms forward far enough so that the meeting of the index-fingers and thumbs forms a triangle.

Exercise D is intended to bring the abdominal muscles also into play, or, in other words, to combine abdominal and chest breathing. To this end the erect position is assumed, as at the beginning of all the exercises, with the hands meeting in front, and the little fingers and the edge of the palms touching the abdominal muscles (Fig. 7). Taking a deep inspiration, raise the diaphragm, concentrating all attention on this act, and while doing so move the joined hands upward, sliding them along the thorax up to the chin; then, turning them, continue to raise them until they are above the head, as in Fig. 6. Bend backward during the four seconds while retaining the air, and then exhale, lowering the arms gradually to the horizontal and to the original position of "attention."

The fifth breathing or respiratory exercise, E, which may also be called a dry swim, requires more strength and endurance. It should not be undertaken until the other exercises have been practised regularly several times a day for a few weeks, and until an evident improvement in breathing and general well-being has been observed. One takes the usual military position of "attention," and then stretches the arms out as if in the act of swimming (Fig. 8), the backs of the hands touching each other. During the inspiration the arms are moved outward until they finally meet behind the back, remaining in this position for the usual four seconds, counting by moving the hands while retaining the air, and at the fifth exhale, bringing the arms forward again, ready to start for another swim; or if this is the end of the dry swim, the arms return to the original position of "attention."

This somewhat difficult exercise can be facilitated and rendered more effective by rising on the toes during the act of inhalation and descending during the act of expiration.

It will be seen that with the aid of these five respiratory exercises every part of the body, from the nostrils down to the toes, is brought into play. The face alone is at rest, and can serve as an indicator that the exercises are properly done, for it must be borne in mind that they must be taken with the muscular system relaxed, and all unnecessary contraction of the muscles or tremor-like movements must be avoided.

One cannot, of course, when out of doors, always take these exercises with the movement of the arms without attracting attention. Under such

Fig. 8.—Respiratory exercise E: swimming motion.

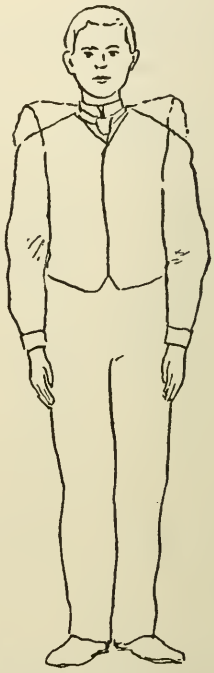


Fig. 9.—Respiratory exercise F: raising of shoulders upward and downward.

conditions one quietly assumes a position similar to "attention," raises the shoulders, making a rotary movement during the act of inhaling (Fig. 9), remains in this position, holding the breath for four seconds, and then exhales, while moving the shoulders forward and downward, assuming again the normal position. This exercise, F, can be easily taken while walking, sitting, or riding in the open air.

Young girls and boys, and especially those who are predisposed to tuberculosis, often acquire the habit of stooping. To overcome this, the following exercise, G, is to be recommended. The child makes his best effort to stand

straight, places his hands on his hips, with the thumbs in front, and then bends slowly backward as far as he can during the act of inhaling (Fig. 10). He remains in this position for from four to five seconds, while holding the breath, and then rises again somewhat more rapidly during the act of exhalation, assuming the original position, with hands on hips.

The following general rule concerning breathing exercises should always be remembered: Commence with the easier exercises (A), and when these are completely mastered, proceed to the more difficult ones. Take from four

Fig. 10.—Respiratory exercise G: to overcome stooping position.

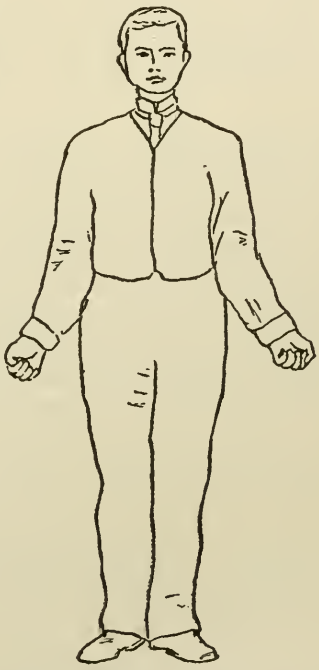


Fig. 11.—Respiratory exercise H: showing the second forced exhalatory movement.

to six respiratory exercises (one of A, B, C, D, E, or F), or when outdoors simply exercise F, four to six times every half-hour or hour, or at least four to six times a day, and on rising in the morning and on retiring at night. Continue this practice until deep breathing has become a natural habit. These exercises should always be taken in an atmosphere as fresh and as free from dust as possible. Never take these breathing exercises when tired, and never continue them to the point of exhaustion.

These exercises are intended for children who are not as yet tuberculous,

and while I believe them to be of incalculable benefit as a means of helping a child to overcome a predisposition to tuberculosis, they can do harm if the child is very delicate and if not administered judiciously. If not carried to excess, they will never be harmful to the healthy child. These breathing exercises should be made a regular and frequent part of the day's work in all schools.

As an additional means of developing the lungs of children, particularly school-children, we cannot too strongly recommend the frequent practice of singing and recitation in the open air. Barth in Köslin, Germany, has made a careful study of the effects of singing on the action of the lungs and heart, on diseases of the heart, on the pulmonary circulation, on the blood, on the vocal apparatus, the upper air-passages, the ear, the general health, the development of the chest, on metabolism, and on the activity of the digestive organs, and has come to the conclusion that singing is one of the exercises most conducive to health. Considering the fact that it can be practised everywhere where the air is pure or at any time, without apparatus, it should be much more cultivated than it actually is. The German military authorities, which have the reputation for instituting all exercises which tend to invigorate the soldiers, have of late years encouraged singing during marches of all troops. Visits to zoölogical gardens, botanizing tours, geological excursions, and mountain climbing should form an important part of the curriculum throughout school life. They will tend to develop the pupils' physique and strengthen its resisting power to the invasion of the tubercle bacilli. These outdoor instructions should not be limited to the summer season only.

After having mastered all the exercises just described, there is one which, for the older child particularly, will help to develop his chest. This is exercise H, and is practised in the following way: he takes the usual position of "attention," then inhales deeply, rolling the shoulders upward and backward, holding the air for four seconds, as in exercise F (Fig. 9), and at the fifth second exhales all he possibly can, again resuming the original position, but before again inhaling makes a second expiratory effort while turning his arms outward (movement of supination) and pressing the inner side of the upper arms against the chest (Fig. 11). He thus, so to speak, squeezes out all the air there is left in the lungs. A vacuum in the lungs is created, and the subject involuntarily takes a very deep inhalation, after that assuming the ordinary quiet position of "attention."

To demonstrate the value of this exercise, let me again repeat here that during ordinary inhalation and exhalation, that is to say, quiet respiration, the amount of tidal air inhaled is only 500 c.c.; the volume that can be inhaled by the first exercise is 1500 c.c., and the volume that can be exhaled by this exercise is about 1300 c.c. When, now, by the second expiratory effort, aided by the supination of the arms and pressure against the chest,

500 c.c. more of reserve or residual air can be expelled, the value of this exercise, taken before going to work, at recess, and on return from work, or whenever one is surrounded by fresh, pure air, must be evident.

The fact that, in the majority of cases, the tuberculous process begins at the apices has been explained by the supposed faulty inspiratory function of this part of the lungs. I agree in this respect with Hanau,* and consider the almost universally adopted statement of the deficient inspiratory function of the apices erroneous. On the contrary, these portions of the lungs inspire exceedingly well—in fact, almost too well, for dust and micro-örganisms enter there most easily and are found in large quantities in careful post-mortem examinations. What is faulty is the expiratory function of the apices. A thorough exhalation, followed by a forced expiratory effort, as just described, is, to my mind, the only possible way to improve this defect and prevent stagnation and congestion.

If any argument were needed to prove the value of a well-developed chest and deep frequent respiration of good, pure air, confirmation could be had from a reference to the statistics that prove that all mountaineers have deep, well-developed chests, and are the most immune of all people to tuberculosis. While, of course, the fact that mountaineers live, as a rule, in less crowded regions, must be taken into consideration, there is no doubt that their wonderful chest development is one of the principal reasons for their relative immunity from tuberculosis. This immunity is due to the physiological effect on the human body of high altitudes. The circulation is slower, often below the normal in those living constantly in the mountains, and their breathing is deeper, the inspiration longer, and the expiration more complete.

In order to give the child the greatest possible opportunity to breathe fresh, pure air and the best chances for physical development, other factors than those just described must be brought into play. First, the child must have more years of play. A child should not be sent to school before its eighth year. It should have more hours of sleep than most children have, and child labor should be abolished. More playgrounds should be established. Every roof of a tenement-house should be transformed into a playground. With the help of strong wire fencing and awnings such a roof-garden could be utilized the greater part of the year for children of all ages.

Children's school farms, such as are conducted in New York, should be established in all large and small cities. Such a farm, particularly when located in a congested district, does both preventive and constructive work.

Outdoor games and athletic sports should be encouraged everywhere in

* Hanau, A.: "Beiträge zur Pathologie der Lungenkrankheiten," Zeit. f. klin. Med., xii, 1887.

children's schools, and should not be limited to the male sex alone, and particularly not during adolescent life.

When a predisposition has seemingly been overcome, and the child leaves school, it is well to bear in mind the possibility of a relapse into such a condition through an unwise choice of profession or calling. An occupation or a profession demanding a sedentary life and exposing the individual to the inhalation of vitiated air and dust is unsuited for any one who is or was at one time predisposed to tuberculosis.

Concerning the prevention of post-natal infection we must, first of all prohibit the tuberculous mother from nursing her child, and, secondly, see that the artificially fed child is provided with milk that is absolutely pure and free from tuberculous germs and other pathogenic microörganisms.

The most frequent sources of post-natal infection are, perhaps, the following. A tuberculous mother or nurse caresses the child and kisses it on the mouth. Or, while carrying the child in her arms, she coughs, and a drop infection from a bacilliferous spray ensues. Or she prepares the food, tasting it to judge its temperature and flavor through the same rubber nipple or with the same spoon the child uses, and thus unconsciously conveys the germs of the disease from her own mouth to that of the child. As the child grows older it will play on the floor of the room, and if there be a tuberculous subject in the family, the child is, indeed, likely to become infected with the dust in the air, and thus acquire tuberculosis by inhalation. Again, the child may infect its fingers by handling various articles, and, by conveying the infection to its mouth, tuberculosis by ingestion may result. Lastly, should the child's nails be neglected, it may scratch itself with the infected fingers, and thus tuberculosis of the skin, or lupus, may result.

If the following precautions are observed, these infections may be prevented. All tuberculous patients should be careful as to the disposition of their expectoration, and should associate as little as possible with young children. Children should never be kissed on the mouth, and should be taught never to kiss or be kissed by strangers. The floor on which the child plays should be kept scrupulously clean. Carpets serve only as dust and dirt collectors, and not infrequently harbor the germs of contagious diseases; for this reason they should never be used on the floor of play-rooms. The hands and nails of children should be kept as clean as possible. Expectorating on playgrounds should be considered a grave offense and be punished accordingly.

At school the child may contract an ingestion tuberculosis from partaking of the half-eaten fruit of its tuberculous fellow-pupils, or by the exchange of bean-blowers, musical mouth instruments, or chewing-gum.

Inoculation of the child with tuberculosis, even if it is not predisposed to the disease, is occasionally effected through ritual circumcision. This

form of infection manifests itself first as a local disease of the genital organs, later becoming, in a great number of cases, generalized. As a remedy for this evil it is suggested that only such persons be allowed to perform circumcision as have proved before a medical board of examiners that they have the necessary skill. They should be compelled to submit themselves to a medical examination each time they are called upon to perform the rite. Only when bearing a certificate from a regular physician stating their absolute freedom from specific diseases should they be allowed to perform ritual circumcision.

Another reliable measure against the possibility of inoculating the child when the parents insist upon the orthodox method of circumcising, is that of suction by the aid of a glass tube, as practised in France and Germany.

Another source of exposure of the non-tuberculous child to tuberculous infection is the custom, in some cities, of sending foundlings who do not improve in the hospitals to homes in the country. These children are often taken into families in which an invalid, who not infrequently is tuberculous, is intrusted with their care.

A purely philanthropic scheme, intended to overcome the predisposition a child may have inherited from its tuberculous parents, was inaugurated some years ago by Grancher, of Paris. This was conducted by a society called "l'Oeuvre de préservation de l'enfance contre la tuberculose," a society to protect children from becoming tuberculous. This society, through its agents, selects children from tuberculous parents, and sends them to homes in the country, where they are carefully supervised by the society's agents. Proper food, outdoor life, and hygienic surroundings are secured for the children, and the society's reports show that the work has resulted in the preservation of life and the gaining of health and strength, which is, after all, the surest immunity against tuberculosis.

It should be the rule in private, dispensary, and hospital practice to insist upon the examination of all children of tuberculous parents. All children entering public, parochial, or private schools should also be examined periodically. The more attention we pay to avoiding tuberculous infection during childhood; the more carefully we aim to effect the early recognition of a condition predisposing the child to tuberculosis; the more we direct our energy, skill, and knowledge to this end, and the more we interest philanthropic persons in the cause of overcoming this tuberculous predisposition, the greater are our chances for ultimately eradicating the disease in the adult and becoming complete masters of the great white plague.

SECTION IV.

Tuberculosis in Children—Etiology, Prevention and Treatment (*Continued*).

FIFTH DAY. MORNING SESSION.

Friday, October 2, 1908.

PROGNOSIS. HYGIENE OF THE MUCOUS MEMBRANE. SEA AIR TREATMENT. TREATMENT OF GLANDULAR TUBERCULOSIS.

The President, Dr. Jacobi, called the Section to order at ten o'clock.

OEUVRE DE LA PRÉSERVATION DE L'ENFANCE CONTRE LA TUBERCULOSE—SECTION LYONNAISE.

Par Dr. Edmond Weill,
Lyon.

L'Oeuvre Lyonnaise de la préservation de l'enfance contre la tuberculose s'est fondée au mois d'Avril 1906. Elle est rirougeusement calquée sur l'oeuvre similaire fondée à Paris en 1904 par le regretté professeur Grancher, qui a d'ailleurs contribué largement à répandre les idées et leurs applications pratiques dans les différents centres provinciaux.

Le but poursuivi par Grancher et par ceux qui se sont associés à ses efforts, a été de soustraire les enfants sains au contact des tuberculeux, dans les familles misérables ou peu aisées.

L'oeuvre de la préservation considère comme acquises un certain nombre de notions rélatives au développement de la tuberculose.

La contagion parait jouer le rôle principal dans la propagation de cette maladie. L'hérédité n'agit communément que comme cause prédisposante, exceptionellement comme cause efficiente. La contagion s'exerce d'autant plus activement que la prédisposition héréditaire est mieux établie, que le contact entre les sujets infectés et les sujets sains est plus étroit; par conséquent elle menace surtout les familles pauvres qui vivent dans

les caux étroits, mal aérés, souvent mal tenus, et encombrés par un nombre trop considérable d'habitants. On peut ajouter que les conditions d'hygiène générale relatives à l'alimentation, au soleil, à l'air, au repos, y sont déplorables et ajoutent leur effet favorisant. On sait, d'autre qu'à conditions de milieu égales, les enfants sont plus particulièrement exposés à contracter la tuberculose.

Les faits observés par Epstein à Prague, par Heller à Nuremberg et à Munich, démontrent qu'en éloignant les jeunes enfants des familles tuberculeuses, on les préservait complétement. À l'orphelinat agricole de St. Martin, près de Tours, 127 enfants pris dans des familles tuberculeuses, et suivis pendant de longues années, n'ont fourni que trois cas de tuberculose. Leurs frères et soeurs, restés dans la famille, sont tous morts tuberculeux. La tentative de Grancher est conforme à toutes les données cliniques et expérimentales, qu'on a pu réunir sur la tuberculose, et se justifie pleinement.

Les objections qui lui ont été faites n'ont pas tenu devant l'expérience. On à prétendu que les parents, même pauvres, se séparaient difficilement de leurs enfants. C'est une erreur. Du moment que le père ou la mère sont tuberculeux, la misère devient intolérable dans le ménage, et les parents confient volontiers leurs enfants à des sociétés d'assistance, souvent dans le seul but de leur procurer quelque bienêtre, à plus forte raison si la santé de l'enfant doit y trouver son avantage. Il nous est arrivé de recevoir dans notre oeuvre 3, 4 et jusqu'à 5 enfants de la même famille.

On a prétendu aussi que le sujet frappé de la tuberculose dans une famille quittait les siens pour être traité dans un hôpital ou dans un sanatorium. Or il est beaucoup de tuberculeux valides, qui fréquentent les dispensaires antituberculeux ou qui ne se traitent même pas du tout, et qui continuent à travailler. Sans compter les phtisies de forme fibreuse, on peut signaler à ce point de vue, les sujets atteints d'ostéite, d'abcès froids, de fistule à l'anus, d'arthropathies, qui continuent à résider au milieu des leurs et à répandre autour d'eux de nombreux germes de la tuberculose.

On a prétendu aussi que le placement d'enfants tirés d'un milieu tuberculeux était difficile, et ne pouvait s'effectuer que dans des collectivités spéciales, telles que des colonies agricoles. Ce serait là, en effet, une très-heureuse solution de la question, et il serait à désirer que dans chaque région se créât une colonie de ce genre, pour y recevoir les enfants menacés par la tuberculose. Il suffit, dans une grande ville, de parcourrir un hôpital d'adultes, pour voir le nombre de tuberculeux gravement atteints. Il suffit de feuilleter les régistres des dispensaires antituberculeux pour reconnaitre l'énorme proportion des tuberculeux relativement valides. Il est presque naïf de dire que la tuberculose est la maladie par excellence des classes misérables, et le nombre d'établissements agricoles pour recueillir leurs enfants dépasserait de beaucoup les ressources dont peuvent disposer les hygiénistes et les administrations de chaque région.

Aussi faut il accepter sans réserve, pour le moment du moins, la combination très simple et très heureuse imaginée par Grancher. Elle consiste à placer les enfants dans des familles de paysans, au grand air, à la campagne, s'il se peut sur une altitude. L'enfant est en pension, l'oeuvre paye aux nourriciers une rétribution qui varie suivant l'âge. À Lyon, nous donnons 15 fr. par mois pour les enfants au dessus de dix ans; 20 fr. par mois pour ceux qui ont de six à dix ans; 25 fr. par mois, au dessous de six ans. En comptant le trousseau, les frais de déplacement, les dépenses exceptionnelles, on peut estimer le prix de pension entre 300 et 400 fr. par an.

Lorsqu'on place plusieurs frères ou soeurs, on tâche de les réunir dans la même famille, ce que maintient plus facilement encore les liens de la consanguinéité et facilite la tâche du nourricier.

L'oeuvre de la préservation de l'enfance est purement hygiénique. Elle laisse aux parents la direction complète de leurs enfants. C'est aux parents à s'entendre avec les nourriciers sur les questions d'instruction, d'éducation, de morale. De même les parents sont libres de faire visite à leur enfants et de les retirer, à n'importe quel moment, de la famille du nourricier.

Il va de soi, que le choix du nourricier n'est pas laissé au hasard. Il doit présenter des conditions de probité, de moralité et de santé qui donnent toutes garanties à la famille de l'enfant.

Les enfants sont tous répartis dans un certain nombre de foyers qui vont se multipliant. Nous en possédons actuellement 21 dans l'oeuvre lyonnaise. Chaque foyer se trouve dans la circonscription d'un médecin qui fait l'inspection gratuite des enfants et transmet ses observations à l'administration centrale.

Au début, les paysans qui acceptaient des enfants en pension, étaient un peu émus par le mot tuberculose qui figure dans l'intitulé de l'oeuvre. Ils ont compris rapidement qu'on ne leur envoyait que des enfants sains, et sont très heureux de cette nouvelle aubaine qu'ils doivent à l'hygiène, et qui constitue pour eux un appoint qu'ils sont loin de dédaigner. L'oeuvre de la préservation de l'enfance contre la tuberculose, telle que je viens d'en exposer les grandes lignes, a subi l'épreuve du temps. À Paris, où elle fonctionne depuis 4 ans, elle est en pleine prospérité. Le nombre des pupilles dépasse 300. À Lyon en 2 ans, nous avons placé 100 enfants, et à l'heure actuelle nous payons pension pour plus de 50, ce qui constitue une dépense annuelle variant entre 15,000 et 20,000 fr. L'oeuvre de la préservation du type Grancher a évité avec soin les grosses dépenses d'installation, d'arrangement et d'administration qu'entrainerait la création d'établissements collectifs.

Elle a encore l'avantage de maintenir pour les enfants la vie familiale, car entre pupilles et nourriciers, l'entérêt se double bientôt de sentiments plus affectifs, tels qu'en inspire fatalement la vie en commun avec des en-

fants. Ceux-ci s'attachent également à leur nouvelle famille, à la vie de campagne si goutée par de malheureux enfants habitués aux sombres taudis de la grande ville. Il est nous arrivé de voir des pupilles refuser de quitter leurs nourriciers pour revenir chez leurs parents. Un de nos nourriciers a demandé à garder à sa charge complète, un pupille devenu orphelin.

Si bien calculée que soit l'oeuvre pour restreindre la dépense, elle est encore très onéreuse. Il ne s'agit pas en effet, de placer les enfants à la campagne pour quelques semaines, comme l'exemple en est donné par les colonies de vacances, c'est par mois et par années, qu'il faut compter et comme chaque pupille revient à 300 fr. environ, sans compter les frais accessoires et les imprévus, on peut pressentir que les demandes ne peuvent pas être toutes acceuillies. Nous faisons un choix parmi les enfants qui sollicitent notre assistance. Ce sont les familles les plus intéressantes que nous favorisons de préférence. À ce point de vue, nous avons recours aux renseignements très précis fournis par le dispensaire antituberculeux de Lyon, créé et dirigé par notre ami, le professeur Jules Courmont. Le dispensaire antituberculeux possède des enquêteurs qui vont dans les familles de tuberculeux, se documentent très exactement sur leur situation, et nous signalent les cas les plus urgents et les plus dignes d'intérêt. Aussi les deux oeuvres se complétent elles très heureusement.

Ce qui restreint dans une certaine mesure les dépenses de l'oeuvre, c'est le renvoi de l'enfant motivé soit par la demande des parents, soit par la guérison du tuberculeux qu'on fuyait, soit ce qui arrive plus souvent par sa mort. Au 1 Avril 1908, nous avons placé 92 enfants en l'espace de près de 2 ans. Sur ces 92, 46 soit 50%, ont abandonné les avantages de l'oeuvre; 1 enfant est décédé; 1 enfant, orphelin, a été adopté définitivement par ses nourriciers; 4 ont été placés à l'assistance publique; 12 ont été rappelés par leur famille; 28 ont été renvoyés après décès des parents malades.

En somme, sur 92 placés en un peu moins de 2 ans, il ne restait à la charge de l'oeuvre que 46 enfants au 1 Avril 1906. Il est vrai que depuis le 1 Avril nous avons accordé la pension à 10 enfants, ce qui nous fait actuellement 56 enfants à notre charge. Une des lacunes pénibles de nos réglements est relative au renvoi d'enfants dont un des parents, atteint de tuberculose, est mort. Cet événement s'il fait disparaitre la cause même qui avait fait accorder la pension de l'oeuvre aux enfants, ne laisse pas que d'augmenter ou d'entretenir la misère du ménage.

L'expérience relativement courte que nous ont donnée deux ans de pratique de l'oeuvre de la préservation de l'enfance contre la tuberculose, nous permet cependant de parter sur son rôle un jugement favorable. Actuellement nous avons placé plus de 100 enfants sur lesquels nous n'en avons perdu qu'un seul, par maladie accidentelle (une fièvre éruptive). Aucun n'est devenu tuberculeux, bien que pour un tiers des cas l'observation se soit prolongée près de deux ans.

THE PROGNOSIS IN PULMONARY TUBERCULOSIS IN CHILDREN UNDER FIFTEEN YEARS OF AGE.

By Frank A. Craig, M.D.,
Philadelphia.

The ability to form a correct prognosis in any disease must depend largely upon the knowledge obtained by personal experience. Considerable assistance, however, may be gained from a study of the experiences of others, especially with regard to the results obtained under certain definite conditions. The object of this article is to compare the results obtained in children with those secured in adults, and, analyzing the conditions present at the first examination, to determine whether there were any factors that might be considered as having special prognostic significance.

The deductions here made are the result of a study of 193 cases of pulmonary tuberculosis treated during the past five to eight years in the White Haven Sanatorium and in the Henry Phipps Institute, both in the dispensary and in wards of the latter.

No cases were considered that had not been in the sanatorium for at least thirty days, and that were under observation in the dispensary for less than seventy-seven days, with four visits as a minimum. Unless otherwise stated, the cases with disease arrested, much improved, and improved will be grouped together under the heading "improved," and the stationary, progressive, and fatal cases under the heading "unimproved."

The findings have been arranged, first, by making a comparison of the results obtained according to age, sex, involvement, etc.; the subject is then considered as a whole, with special reference to any special factors that may seem to have a bearing on the question.

Sex.

TABLE I.—RELATION BETWEEN THE RESULT OF TREATMENT AND SEX.

Males.				Females.			
Disease arrested	35—36.5%	47—49.0%	87.5%	32—33%	40%	77%	
Much improved	12—12.5%			7— 7%			
Improved	37—38.5%	37—38.5%		36—37%	37%		
Stationary	7— 7.5%	12—12.5%	12.5%	10—11%	23%	23%	
Progressive	2— 2.0%			7— 7%			
Died	3— 3.0%			5— 5%			
Total cases,	96			97			

In the present series of cases the males showed slightly better results, the percentages being higher in all the groups in which the result was favorable, and lower in those in which it was unfavorable. The difference, however, is so slight as to warrant no further conclusion beyond the statement that boys apparently respond somewhat better to treatment than girls. The sexes were almost equal in number, and neither showed any special liability to the disease.

Age.

TABLE II.—RELATION BETWEEN RESULT AND AGE.

Years.	14	13	12	11	10	9	8	7	6	5	4	3	1-3
Arrested	35%	42%	39%	31%	33%	43%	37%	20%	18%	25%	50%	25%	0%
Much improved	14%	16%	14%	6%	0%	0%	0%	10%	9%	0%	50%	0%	0%
Improved	32%	23%	36%	37%	57%	43%	26%	40%	73%	50%	0%	50%	0%
Stationary	5%	3%	0%	19%	5%	14%	37%	20%	0%	25%	0%	25%	100%
Progressive	5%	10%	11%	0%	5%	0%	0%	0%	0%	0%	0%	0%	0%
Died	9%	6%	0%	7%	0%	0%	0%	10%	0%	0%	0%	0%	0%
Number of cases	43	31	28	16	21	14	8	10	11	4	2	4	1

TABLE III.—RELATION BETWEEN RESULT AND AGE (Condensed).

Years.	10-14 Inclusive.		6-9 Inclusive.		5 and Under.	
Arrested and much improved	48.2%	83.5%	35%	81%	36%	72%
Improved	35.3%		46%		36%	
Stationary, progressive, and died	16.5%	16.5%	19%	19%	28%	28%
Number of cases	139 (72%)		47 (24.4%)		7 (3.6%)	

The ages range from sixteen months to fourteen years, the majority of the cases being between ten and fourteen years, only 10 being under six years of age. For this reason the figures for the younger children have very little significance. The older cases show a better result than the younger. Those between ten and fourteen years show only very slightly better results than those between six and nine years; the results in those of five years and under are not nearly so good as in the older cases, but, as has been stated, there were so few of the cases in this last age period that the value of the statement in regard to these very young cases is much reduced.

A great deal has been written regarding the unfavorable prognosis in young children, especially in those under eight years of age, and yet, from a glance at Table II, it will be seen that only one case was progressive or fatal in children under eight years of age, all the remaining cases that failed to improve being stationary. Bonney goes so far as to state that "No child

under eight years has secured an arrest of pulmonary tuberculosis while under my supervision." He mentions the extremely satisfactory results in children between eight and fifteen years. From the present figures it would appear that the results are better in children over five years, and the prognosis is slightly better in those above than in those under nine years.

Race.

TABLE IV.—RELATION BETWEEN RESULT AND RACE.

	Celt.		Hebrew.		Teuton.	American.	
Arrested	3—15%	25%	5—22.5%	27%	0	1—25%	25%
Much improved	2—10%		1— 4.5%		0	0	
Improved	9—45%	45%	12—55.0%	55%	11—100%	1—25%	25%
Stationary	1— 5%		3—13.5%		0	0	
Progressive	3—15%	30%	0— 0.0%	18%	0	1—25%	50%
Died	2—10%		1— 4.5%		0	1—25%	
Number of cases	20 (28%)		22 (31%)		11 (15%)	4 (5%)	

Table IV (*Continued*).—Relation Between Result and Race.

	Negro.		Latin.	Anglo-Saxon.	White.		Black.	
Arrested	4—36.0%	36%	0	0	63—35.0%	45%	4—36.0%	36%
Much Improved	0		0	0	19—10.0%		0	
Improved	4—36.0%	36%						
Stationary	1— 9.3%	28%	1—50%	2—100%	69—38.0%	38%	4—36.0%	36%
Progressive	1— 9.3%		1—50%	0	16— 9.0%	17%	1— 9.3%	28%
Died	1— 9.3%		0	0	8— 4.5%		1— 9.3%	
			0	0	7— 3.5%		1— 9.3%	
Number of cases	11 (15%)		2 (3%)	2 (3%)	182		11	

In the cases studied the race was recorded in only a small proportion of the histories (68). It was a rather curious coincidence (?) that the eleven Teutons or children of Teutonic parents were all improved—in other words, none of them did very well or very ill. The Celts showed improvement in 70 per cent. of the cases and the Hebrews in 82 per cent. The other races were represented by so few that the figures are useless.

Color.

Although there were only eleven negroes studied, the high proportion showing improvement is rather remarkable. (See Table IV.)

The relative percentage of those showing improvement, while not so good, compares very favorably with the results in the whites, notwithstanding the general view to the contrary. The only reason to account for this rather unexpected finding is the fact that a greater proportion of them were treated in the sanatorium, where the results were better than in the dispensary. (See Method of Treatment, further on.)

Duration of Disease.

TABLE V.—RELATION OF RESULT AND DURATION OF DISEASE.

	Three Months and Less.	Three to Six Months.	Six Months to One Year.
Arrested and much improved	27—49.0%	15—35.7%	15—37.5%
Improved	19—34.6%	15—35.7%	18—45.0%
Stationary, progressive and died	9—16.4%	12—28.6%	7—17.5%
Total	55 (30%)	42 (23%)	40 (21%)
Unrecorded, 8.			

Table V (*Continued*).—Relation of Result and Duration of Disease.

	One to Two Years.	Two to Four Years.	Four to Eight Years.	Over Eight Years.
Arrested and much improved	5—38.5%	12—54.6%	4—40%	1—33%
Improved	7—53.9%	7—31.8%	5—50%	1—33%
Stationary, progressive and died	1— 7.6%	3—13.6%	1—10%	1—33%
Total	13 (7%)	22 (12%)	10 (5%)	3 (2%)

There is, perhaps, no datum obtainable in the histories of tuberculous patients that is so indefinite and uncertain as the duration of disease. The phrase "period of manifestation" would be a more appropriate title for this division of the subject, as that is really what the figures indicate. To determine this point with any degree of accuracy, requires, in the average case, considerable care on the part of the examining physician.

The cases have been divided into groups as follows: Three months and under, six months, one, two, three, four, and eight years and over. In these groups the cases that were unimproved followed a rather peculiar curve.

Starting with those of shortest duration, with 16.4 per cent. of unimproved cases, there is a slight rise in the next division; the proportion then falls in the one year division, and again in the one to two year division, where it is the lowest of all (7.6 per cent.). The curve then gradually rises in the

four and eight year division, with a marked rise in the cases of longer than eight years' duration, where it is the highest of all (33 per cent.).

The explanation suggested is that the cases with a history of only a few months' duration are probably more acute in type than those that have lasted longer. These more chronic forms respond well to treatment, provided they receive the proper attention before the condition has existed too long. The rather high proportion of unimproved cases in those of six months' duration is probably due to the fact that in the more acute cases the disease has had an opportunity to extend further.

The majority of cases were of one year's duration or less, and yet the number of cases in which the disease had existed much longer is surprisingly high. Most writers state that the disease is of quite short duration in children. Ashby and Wright state that "the progress of such cases is apt to be more rapid than it is in adults, a fatal result occurring in four to six months." In the present series of cases, at least, there was nothing to indicate that any such rapid progress occurred.

In the belief that this might be explained by a study of the relation between the duration of the disease and the amount of lung tissue involved the following table was prepared.

TABLE VI.—RELATION OF DURATION OF DISEASE AND AMOUNT OF INVOLVEMENT.

	Three Months and Less.		Three to Six Months.		Six Months to One Year.	
One apex and one lobe	33—63%	88%	24—57%	88%	32—80%	90%
Both apices, one apex and one lobe, and two lobes	13—25%		13—31%		4—10%	
One to two lobes, with cavity	0	12%	1— 2%	12%	2— 5%	10%
More than two lobes	6—12%		4—10%		2— 5%	

Table VI (*Continued*).—Relation of Duration of Disease and Amount of Involvement.

	One to Two Years.		Two to Four Years.		Four to Eight Years.		Over Eight Years.	
One apex and one lobe	7—53%	84%	16—73 %	95.5%	6—60%	80%	2—66%	100%
Both apices, one apex and one lobe, and two lobes	4—31%		5—22.5%		2—20%		1—33%	
One to two lobes, with cavity	0	16%	1— 4.5%	4.5%	1—10%	20%	0	
More than two lobes	2—16%		0		1—10%		0	

A study of this table shows that there is absolutely no definite relation between the amount of involvement and the duration of the disease. It does, however, confirm to a certain extent the statements made in regard to the cases of shorter duration being probably of a more acute form; at least we do not find so high a percentage of very slight involvement in the six as in the three month cases. At one year, however, we find the highest percentage of very slightly involved cases. This can be explained only on the grounds that these cases are of the more chronic type of disease.

Amount of Pulmonary Involvement.

TABLE VII.—RELATION OF RESULT AND AMOUNT OF PULMONARY INVOLVEMENT.

	One Apex.		One Lobe.		Two Apices.		One Apex, One Lobe.	
Arrested	31—40%	90%	16—31%	94%	8—50%	93%	7—37%	68%
Much improved	8—10%		8—16%		1— 7%		1— 5%	
Improved	31—40%		24—47%		6—36%		5—26%	
Stationary	8—10%	10%	3— 6%	6%	0	7%	3—16%	32%
Progressive and died	0		0		1— 7%		3—16%	
Total	78 (40%)		51 (26%)		16 (8%)		19 (10%)	

Table VII (*Continued*).—Relation of Result and Amount of Pulmonary Involvement.

	Two Lobes.		One or Two Lobes with Cavity.		More than Two Lobes.		More Than Two Lobes with Cavity.	
Arrested	5—50%	80%	0	40%	0	43%	0	100%
Much improved	1—10%		0		0		0	
Improved	2—20%		2—40%		3—43%		0	
Stationary	0	20%	1—20%	60%	1—14%	57%	1—14%	
Progressive and died	2—20%		2—40%		3—43%		6—86%	
Total	10 (5%)		5 (3%)		7 (4%)		7 (4%)	

The amount of involvement, as would naturally be expected, gives the most definite information upon which to base a prognosis. The figures show some very interesting facts. So far as improvement was concerned, there was practically no difference between the cases with only one apex, one lobe, and both apices, all showing but a small proportion of cases that failed to improve. No case with only one apex involved became "progressively worse" or died. The proportion of improved cases decreases in the cases with one lobe and one apex, and also in those with two lobes, although the decrease

is not so great in the latter. When we consider the cases with one or two lobes with cavity formation, or with more than two lobes with or without cavity formation, we find that in no single case is the "disease arrested" or "much improved." Moreover, in no case in which there were more than two lobes involved, with cavity formation, was there any improvement in the patient's condition. In only one of these cases did the disease remain stationary. These findings are quite in accord with the statements of various writers that if the disease is advanced, the prognosis is very unfavorable in children.

Stage of Disease.

TABLE VIII.—RELATION OF RESULT AND STAGE OF DISEASE.

	Incipient (Favorable).		Moderately Advanced.		Far Advanced.	
Arrested	31—40%	89%	36—38%	88%	0	33%
Much improved	7— 9%		11—12%		1— 4%	
Improved	31—40%		36—38%		6—29%	
Stationary	8—11%	11%	6— 6%	12%	3—14%	67%
Progressive and died	0		6— 6%		11—53%	
Total	77 (40%)		95 (49%)		21 (11%)	

The cases have been divided according to the Turban method, as modified by the National Association, into Stages I, II, and III.

The only points of interest in this regard are that there is very little difference in the results in Stages I and II, except that in Stage I there were no cases that became progressively worse or died. In Stage III only one case showed much improvement, and this case was only placed in Stage III on account of a complication (empyema), the patient otherwise being in fairly good condition. None of the cases in this stage had disease arrested, and the majority of them (67 per cent.) became "progressively worse" or died.

Source of Infection.

TABLE IX.—RELATION OF RESULT AND SOURCE OF INFECTION.

	Parental.		Other Sources.	
Arrested	40—39%	82%	25—28%	82%
Much improved	5— 5%		14—15%	
Improved	38—38%		35—39%	
Stationary	8— 8%	18%	9—10%	18%
Progressive and died	10—10%		7— 8%	
Total	101 (53%)		90 (47%)	

Unrecorded in two cases.

The subject under discussion may seem out of place in an article on prognosis. The view, however, that children whose parents are or have been tuberculous do not do so well as children of healthy parents is so prevalent that it was deemed advisable to consider what effect, if any, a history of tuberculous parentage had upon the result of treatment. One frequently encounters such statements as these: "Family history of consumption adds to the gravity of the outlook, showing a lessened power of resistance to the toxins" (Taylor and Wells); "The personal equation depends largely on the family history; if good, the prognosis is hopeful" (Cotton).

When one compares the two, one finds that the proportion of cases that improved and of those that did not improve are exactly the same in the two groups. One finds, moreover, that among the cases in which there was a family history of tuberculosis in one or both parents the percentage of cases with disease arrested was higher than in cases in which there was no history of tuberculosis in the parents. The latter, however, showed a lower percentage of progressive and fatal cases. We are, therefore, led to conclude that a history of tuberculosis in one or even in both parents does not influence the prognosis either one way or the other. It is barely possible that, in those cases in which the parents are known to be suffering from the disease, the condition may be recognized earlier and the case, therefore, have a better chance of recovery.

Pulse-rate.

TABLE X.—RELATION OF RESULT AND PULSE-RATE.

	Sanatorium and Hospital Cases.			
	Eighty and Under.	Eighty-one to One Hundred.	One Hundred and One to One Hundred and Twenty.	Over One Hundred and Twenty.
Arrested	14—70%	23—51%	5—28%	0
Much improved	2—10% 95%	11—25% 91%	1— 5% 55%	0
Improved	3—15%	7—15%	4—22%	1—33%
Stationary	1— 5%	0	2—11%	0
Progressive and died	0 5%	4— 9% 9%	6—34% 45%	2—67%
Total	20 (23%)	45 (52%)	18 (21%)	3 (4%)

TABLE X (*Continued*).—RELATION OF RESULT AND PULSE-RATE.

	Dispensary Cases.							
	Eighty and Under.		Eighty-one to One Hundred.		One Hundred and One to One Hundred and Twenty.		Over One Hundred and Twenty.	
Arrested	3—14%	96%	12—23%	85%	7—32%	77%	1—12%	37%
Much improved	0		4— 8%		1— 4%		0	
Improved	18—82%		28—54%		9—41%		2—25%	
Stationary	1— 4%	4%	8—15%	15%	4—19%	23%	1—12%	63%
Progressive and Died	0		0		1— 4%		4—51%	
Total	22 (21%)		52 (50%)		22 (21%)		8 (8%)	

The figures that have been selected for the estimation of the value of the pulse-rate have been taken from the records on admission or at the first visit of the patient. Although these figures are open to many objections on the grounds of being uncertain and inaccurate, still they represent the conditions under which the pulse is usually taken when one is called upon to give a prognosis. The figures have been analyzed with the object of determining whether the pulse, taken under these various conditions, gives any information of value in prognosis.

As some of the records were made in the dispensary, they have been tabulated separately, since the conditions were so very different from those in the sanatorium and hospital cases, where the pulse was taken with the patient at rest. As one would expect, the pulse-rate in the dispensary cases ranged slightly higher than the others, although not to a very marked degree.

It will be seen that no case with a pulse of eighty or under, in either group of cases, became progressively worse or died, and that in only 2 out of the 42 cases the disease remained stationary. The proportion of cases that failed to improve increases with the increased pulse-rate.

The findings in the sanatorium and hospital cases were much more constant and definite than in the dispensary cases. It would appear, therefore, that if one is to secure the most accurate information from the pulse for the purpose of prognosis, the pulse must be taken with the patient at rest. This applies in the case of children to a greater extent than in adults, as the pulse in children is more readily affected by excitement, etc. When, under these circumstances, the pulse is above 120 a minute, one cannot expect an "arrest of disease" or even "much improvement"; with a pulse of 100 or under "arrest of disease" or "much improvement" may be expected in 80 per cent. of the cases, two-thirds of these cases being the former (disease arrested).

Although considerable stress has always been laid upon the importance

of the pulse as an aid in prognosis, I have never seen any figures except the present that so clearly demonstrate this fact.

Respiratory Rate.

TABLE XI.—RELATION OF RESULT AND RESPIRATORY RATE.

	Sanatorium and Hospital Cases.		
	Twenty-four and Under.	Twenty-five to Thirty-two.	Over Thirty-two.
Arrested	24—56% } 98%	5—32% } 53%	0 } 40%
Much improved	11—21%	1— 5%	1—20%*
Improved	11—21%	3—18%	1—20%
Stationary	0 } 2%	2—11% } 47%	0 } 60%
Progressive and died	1— 2%	6—36%	3—60%
Total	52 (70%)	17 (23%)	5 (7%)
Unrecorded, 12. * Empyemic.			

Table XI (*Continued*).—Relation of Result and Respiratory Rate.

	Dispensary Cases.		
	Twenty-four and Under.	Twenty-five to Thirty-two.	Over Thirty-two.
Arrested	18—27% } 88%	0 } 67%	3—27% } 82%
Much improved	1— 2%	4—22%	0
Improved	39—59%	8—45%	6—55%
Stationary	6— 9% } 12%	4—22% } 33%	2—18% } 18%
Progressive and died	2— 3%	2—11%	0
Total	66 (69%)	18 (19%)	11 (12%)
Unrecorded, 12.			

The statements in regard to the necessity of having the patient at rest apply to even a greater extent in estimating the respiratory rate than in the case of the pulse.

Examining the findings, therefore, in the cases in which the records were taken in the sanatorium or in the hospital wards we note, then, with a respiratory rate of 24 or less only one case out of a total of 52 failed to improve. With a respiratory rate of over 32 only one case in a total of five showed much improvement, this case being complicated by an empyema. None of the cases with a rate over 32 had disease arrested.

We could, therefore, consider a respiratory rate of 24 or less a very favorable prognostic sign, and one over 32 very unfavorable. These figures apply only when obtained with the patient at rest.

Temperature.

TABLE XII.—RELATION OF RESULT AND TEMPERATURE.

	Sanatorium and Hospital Cases.							
	98.8° and Under.		99° to 99.8°		100° to 100.8°		101° and Over.	
Arrested	25—56%	86%	14—48%	86%	2—33%	83%	1—14%	43%
Much improved	5—12%		7—24%		2—33%		0	
Improved	8—18%		4—14%		1—17%		2—29%	
Stationary	1— 2%	14%	2— 7%	14%	0	17%	0	57%
Progressive and died	5—12%		2— 7%		1—17%		4—57%	
Total	44 (51%)		29 (34%)		6 (7%)		7 (8%)	

Table XII (*Continued*).—Relation of Result and Temperature.

	Sanatorium and Hospital Cases.		Dispensary Cases.					
	98.8° and Under.		99° to 99.8°		100° to 100.8°		101° and Over.	
Arrested	10—24%	88%	11—29%	81%	1— 7%	64%	2—29%	71%
Much improved	1— 2%		1— 3%		3—21%		0	
Improved	26—62%		18—49%		5—36%		3—42%	
Stationary	4—10%	12%	7—19%	19%	3—22%	36%	0	29%
Progressive and died	1— 2%		0		2—14%		2—29%	
Total	42 (42%)		37 (37%)		14 (14%)		7 (7%)	
Unrecorded, 7.								

Only extremely high temperatures (101° F. and over) appear to have any prognostic significance, and then only when taken with the patient at rest. Up to 100.8° there appears to be very little difference in the results, about an equal proportion of cases improving in those over and those under 99.8° F.

Sputum.

TABLE XIII.—RELATION OF RESULT AND SPUTUM EXAMINATION.

	Tubercle Bacilli Present.		Tubercle Bacilli Absent or No Expectoration.	
Arrested	10—30.5%	54.5%	38—33.6%	87.2%
Much improved	3— 9.0%		13—10.0%	
Improved	5—15.0%		51—43.6%	
Stationary	1— 3.0%		12— 9.0%	
Progressive and died	14—42.5%	45.5%	3— 3.8%	12.8%
Total	33 (22%)		117 (78%)	
Unrecorded, 43.				

Out of 150 cases tubercle bacilli were present in 33 (or 22 per cent.). Of the remaining 117 cases a certain proportion had no expectoration, while in the others the examination was negative. The presence of tubercle bacilli had no effect on the result, the number improving and not improving being about the same, with a very slight majority in favor of the former.

Of the cases in which the bacilli were absent or there was no expectoration, a much greater number of cases showed improvement.

The absence of tubercle bacilli would, therefore, appear to be in the patient's favor; the presence of the bacilli appears to have no effect on the result one way or the other.

Urine.

TABLE XIV.—RELATION OF RESULT AND URINE EXAMINATION.

	Normal.		Abnormal.		Albumin.	Casts.	Albumin and Casts.
Arrested	44—41%	86%	6—23%	69%	4	1	1
Much improved	14—12%		1— 4%		1	0	0
Improved	36—33%		11—42%		9	1	1
Stationary	8— 8%	14%	1— 4%	31%	0	0	1
Progressive and died	7— 6%		7—27%		5	2	0
Total	109 (80%)		26 (20%)		19	4	3
Unrecorded, 58.							

A study of the results of urine examination reveals an exceedingly high proportion of cases in which there was some abnormality. A comparison of the findings with a series of cases of over fourteen years of age shows that abnormalities of the urine occur in only about one-half the proportion of cases under fourteen, as compared with the older cases of tuberculosis. Previous writers have called attention to this frequency of urinary abnormalities in tuberculous subjects.

The cases in which some abnormality was present show a rather high proportion of "improved"—much larger than one would expect to find, though not so high as in the cases in which the urine was normal. The presence of albumin, casts, or albumin and casts does not appear to have any great prognostic significance in children; their absence, however, being in the patient's favor.

Complications.

TABLE XV.—RELATION OF RESULT AND COMPLICATIONS.

	Tuberculous.						
	Adenitis.	Bone Lesion.	Skin Lesion.	Peritonitis.	Laryngitis.	Enteritis.	Meningitis.
Arrested	5	1	1	0	0	0	0
Much improved	0	0	0	0	0	0	0
Improved	5	3	1	2	0	1	0
Stationary	1	1	0	0	0	0	0
Progressive	1	0	0	0	0	0	0
Died	0	0	0	0	2	1	1
	12	5	2	2	2	2	1

Table XV (*Continued*).—Relation and Result of Complications.

	Non-tuberculous.				
	Pleurisy.	Otitis Media.	Mitral Insufficiency.	Epilepsy.	Empyema.
Arrested	2	1	1	2	0
Much improved	0	0	0	0	1
Improved	2	0	1	0	0
Stationary	1	0	0	0	0
Progressive	1	0	0	0	0
Died	0	1	0	0	0
	6	2	2	2	1

In addition to the tabulated cases tetany, keratitis, cardiac dilatation, phlyctenular conjunctivitis, and tænia saginata were each present once.

The complications were so few in number and appeared to have so little effect upon the result that no special reference will be made to them, beyond calling attention to the fact that the two cases of tuberculous laryngitis and the case of tuberculous meningitis ended fatally.

Method of Treatment.

In estimating the results of treatment in different institutions the stage of disease must be taken into consideration. The sanatorium accepts only early cases, the hospital only advanced cases, while the dispensary treats both classes of cases.

TABLE XVI.—RELATION OF RESULT AND METHOD OF TREATMENT.

	Stage I.—Incipient.				
	Sanatorium.		Dispensary		Hospital.
Arrested	17—65%	96%	11—23%	85%	0
Much improved	5—20%		2— 5%		0
Improved	3—11%		26—57%		1—100%
Stationary	1— 4%	4%	7—15%	15%	0
Progressive and died	0		0		0
	26		46		1

Table XVI (*Continued*).—Relation of Result and Method of Treatment.

	Stage II.—Moderately Advanced.				
	Sanatorium.		Dispensary.		Hospital.
Arrested	21—55%	97%	5—13%	85%	0
Much improved	8—21%		3— 8%		0
Improved	8—21%		25—64%		0
Stationary	1— 3%	3%	5—13%	15%	0
Progressive and died	0		1— 2%		1—100%
	38		39		1

Table XVI (*Continued*).—Relation of Result and Method of Treatment.

	Stage III.—Far Advanced.					
	Sanatorium.		Dispensary.		Hospital.	
Arrested	1—20%	40%	0	42%	0	24%
Much improved	0		0		1—12%	
Improved	1—20%		3—42%		1—12%	
Stationary	1—20%	60%	2—29%	58%	0	76%
Progressive and died	2—40%		2—29%		6—76%	
	5		7		8	

The cases in Stage I and Stage II appear to do somewhat better under sanatorium than under dispensary treatment. While not so great as one would expect, the difference between the two methods of treatment is still quite distinct. The cases in Stage III do equally well in the sanatorium and dispensary, what little difference is noted being in favor of the dispensary. It must be understood that these figures refer only to cases in the poorest

circumstances. The difference in the results between the cases treated in the sanatorium and those treated in their homes would, perhaps, not be so great if the patients were of a higher class.

General Results in Children.

TABLE XVII.—RELATION OF RESULTS IN CHILDREN AND ADULTS.

	Phipps Institute.				White Haven Sanatorium.	
	Fifteen Years and Over.		Under Fifteen Years.		Fifteen Years and Over.	
Arrested	50— 2%	43%	16—16%	77%	548—24%	87%
Much improved			6— 5%		492—21%	
Improved	1243—41%		56—56%		954—42%	
Unimproved	1224—41%	57%	19—19%	23%	277—12%	13%
Died	484—16%		5— 4%		23— 1%	
	3001		102*		2294	

Table XVII (*Continued*).—Relation of Results in Children and Adults.

	White Haven Sanatorium.		Combined.			
	Under Fifteen Years.		Fifteen Years and Over.		Under Fifteen Years.	
Arrested	39—56%	93%	598—11%	62%	67—35%	83%
Much improved	13—19%		492— 9%		19—10%	
Improved	12—18%		2197—42%		73—38%	
Unimproved	4— 6%	7%	1501—29%	38%	26—13%	17%
Died	1— 1%		507— 9%		8— 4%	
	69*		5295		193	

A comparison of the results obtained in patients of fifteen years and over with the results in the series of cases here under consideration reveals some rather interesting facts. The figures indicate that a relatively greater number of children under fifteen showed improvement than was the case in those of fifteen years and over. The difference in the cases of the two series treated at the Phipps Institute was very striking. It has been shown that advanced cases in children did not do nearly so well as similarly advanced cases in adults. Unfortunately, it is impossible to show this difference graphically. The facts already brought out, however, demonstrate this fairly well.

* Twenty-two cases not considered, as they were treated in both institutions.

Ashby and Wright* have stated the matter very clearly: "In this stage (early) children perhaps more often than adults improve under treatment and a careful hygiene and may be restored to perfect health; there is abundant evidence to demonstrate this." Pfaundler and Schlossman, in their "Handbuch der Kinderheilkunde," state that the prognosis in chronic pulmonary tuberculosis is not bad if the disease is in an early stage, although they believe that permanent cures are seldom encountered, the disease being likely to manifest itself later. As to the permanency of the results in the present series of cases not much can be said, as we have been able to obtain information on this point in only few cases, which give the figures no value.

Many children come under observation in whom the general condition of the patient, together with the history, indicates the presence of tuberculosis, but in whom it is very difficult to demonstrate any pulmonary lesion. Their condition corresponds more closely to the "pretuberculous stage" of the French writers. The series of cases under consideration probably contains a certain number that could be properly grouped in this class. This may account to some extent for the extremely good results obtained. We do not feel, however, that this affects the findings in the slightest degree. With the knowledge of the very excellent results to be obtained in these cases we should more than ever be on our guard in our examination of children.

TABLE XVIII.—RELATION OF RESULT AND PROGNOSIS.

	Favorable.		Doubtful.		Unfavorable.	
Arrested	58—43%		2— 7%		2—10%	
Much improved	15—11%	92%	2— 7%	70%	0	25%
Improved	51—38%		15—56%		3—15%	
Stationary	7— 6%		6—22%		3—15%	
Progressive and died	3— 2%	8%	2— 8%	30%	12—60%	75%
Total	134 (74%)		27 (15%)		20 (11%)	

A study of the foregoing table shows that with our present knowledge we are able to make a fairly accurate prognosis. Only a very small percentage of those in whom a favorable prognosis had been made failed to improve, and in three-fourths of those in whom the prognosis was unfavorable the results were unfavorable. In a fairly large number of cases the prognosis was doubtful.

From the facts brought out by a study of the foregoing we would arrive at the following conclusions:

1. Children under five years of age do not respond to treatment as readily

* "The Diseases of Children," edited by Northrup.

as those over this age, the results improving slightly with the age of the patient.

2. White children appear to do somewhat better than colored; in the present series of cases, however, the latter showed the same proportion with disease arrested.

3. The amount of pulmonary involvement gives the best indication in regard to prognosis. No case in which only one apex is involved should become "progressively worse" or "die." Only a very small proportion of these cases fail to improve. We cannot expect improvement in any case in which more than two lobes are involved with cavity formation; the great majority of these cases either become "progressively worse" or die.

4. A history of tuberculosis in the parents has absolutely no influence upon the prognosis either one way or the other.

5. Next to the amount of involvement, the pulse-rate gives the most valuable information from the standpoint of prognosis. To be of most value, the pulse should be taken with the patient at rest. When taken under these conditions no patient with a pulse of 80 or under should become "progressively worse" or die. Seventy per cent. of these cases show "disease arrested." With a rate over 120 we cannot expect either "arrest of disease" or "much improvement."

6. The respiratory rate gives also very valuable information. With a respiratory rate of 24 (at rest) or under, only 2 per cent. fail to improve. With a rate above 32 no improvement can be looked for in an uncomplicated case.

7. The temperature seemed to have very little value except that a temperature of 101° F. and over seemed to have an unfavorable significance.

8. The absence of tubercle bacilli from the sputum and a normal urine are favorable indications. The presence of the bacilli in the sputum and the presence of albumin or casts in the urine cannot, however, be considered as very unfavorable signs.

9. Cases in Stages I and II do slightly better under sanatorium treatment. The cases in Stage III do equally well in sanatorium and dispensary.

10. The results in children under fifteen years are very much better than in patients of fifteen years and over. This does not apply to cases with extensive involvement, which do not do as well as the older cases.

On examining the records it was found that there were only four cases in which what might be called ideal conditions existed. These cases, in other words, had only one apex involved, the pulse was 80 or under, the respirations were 24 or under, they were white, between the ages of ten and fourteen, were treated in a sanatorium, and the urine and sputum were negative. *They all showed disease arrested.* Curiously enough, three out of the four gave a history of tuberculosis in the parents.

El Pronostico de la Tuberculosis Pulmonar en los Niños Menores be Quince Años.—(Craig.)

Este articulo es basado sobre el estudio de 193 casos de tuberculosis pulmonar en los niños, la edad es de 16 meses á 14 años. Se presentan cuadros de comparacion de los resultados de la condicion del paciente cuando este por primera vez fue observado.

Se da consideracion especial en cuanto al sexo, raza, color, duracion de la enfermedad, extension de la afeccion tuberculosa, frecuencia del pulso y de la respiracion, temperatura, examen del esputo y de la orina, complicaciones, metodos del tratamiento (en sanatorios, dispensarios ó en los hospitales dela ciudad), y se comparan los resultados con aquellos obtenidos en los adultos.

La cantidad de la extension de la enfermedad dio la informacion mas exacta en cuanto al pronostico. Entre los casos en los cuales uno ó dos lobulos estaban afectados con la formacion de cavidades, ó la afeccion de dos ó mas lobulos, con la formacion de cavidades ó sin esta, en ninguno de los casos fue el curso de la enfermedad detenido ó mejorado.

Segundo en importancia fue la frecuencia del pulso. En ninguno de los pacientes con un pulso de 80 por minuto ó menos, la condicion de la enfermedad fue empeorada o fallecio, y en ninguno de los pacientes con un de 120 por minuto fue el proceso de la enfermedad detenido ó majorado.

La frecuencia de la respiracion dio tambien informaciones valiosas. Ninguno de los otros factores dio una indicacion positiva.

Los resultados en los niños de una edad mayor fueron los resultados un poco mas favorables que en los mas jovenes, y los casos tratados en los sanatorios dieron resultados un poco mejor que los tratados en los dispensarios ú hospitales.

Los resultados en los niños fueron mejores que en los adultos cuando la enfermedad no fue muy extensa, mas no tan bien en el estado avanzado de la afeccion.

Le Pronostic dans la Tuberculose pulmonaire chez les Enfants audessous de quinze ans.—(Craig.)

Cet article est basé sur l'étude de 193 cas de tuberculose pulmonaire chez les enfants, d'âges variant entre 16 mois et 14 ans. On donne des tables comparant les résultats avec la condition des malades dès le moment qu'on commença à les observer.

Les aspects spéciaux considérés sont: le sexe, l'âge, la race, la couleur, la durée de la maladie, jusqu'à quel point les poumons étaient atteints, le degré de la maladie, la source d'infection, le taux du pouls et de la respiration, la température, l'examen du sputum et de l'urine, les complications,

la méthode de traitement (sanatorium, dispensaire, ou hôpital de la ville), et comparaison avec les résultats obtenus chez les adultes.

L'étendue de l'affection pulmonaire donna le renseignement le plus sûr au point de vue du pronostic. Dans les cas avec un ou deux lobes affectés, avec formation de cavités, ou avec plus de deux lobes affectés, avec ou sans formation de cavités, on n'a dans aucun cas "arrêté" ou "amélioré beaucoup" la maladie.

Second en importance était le taux du pouls. Nul malade avec un pouls de 80 ou au-dessous ne devient progressivement pire ni ne mourut; et nul malade avec un pouls de plus de 120 n'a eu sa maladie "arrêtée" ou "beaucoup améliorée."

Le taux de la respiration donna aussi des renseignements précieux. Aucun des autres facteurs ne donna d'indications très-positives.

Les enfants plus âgés donnèrent des résultats un peu meilleurs que les enfants plus jeunes; et les cas traités dans le sanatorium donnèrent des résultats un peu meilleurs que ceux traités dans le dispensaire ou l'hôpital.

Les résultats chez les enfants étaient meilleurs que les résultats chez les adultes, quand la maladie n'était pas étendue, mais pas si bons quand la maladie était avancée.

Die Prognose der Lungenschwindsucht bei Kindern unter dem fünfzehnten Lebensjahre.—(CRAIG.)

Der Artikel gründet sich auf das Studium von 193 Fällen von Lungentuberkulose in Kindern, deren Alter zwischen 16 Monaten und 14 Jahren schwankte. Vergleichungstabellen der Ergebnisse des Zustandes der Kranken bei ihrem Eintritte in die Behandlung sind beigegeben.

Als besondere Punkte sind betrachtet: Geschlecht, Alter, Rasse, Farbe, Krankheitsdauer, Ausdehnung der Lungenaffektion, Stadium der Krankheit, Quelle der Ansteckung, Puls und Atmung, Temperatur, Untersuchung von Sputum und Harn, Komplikationen, Methode der Behandlung (Sanatorium, Ambulatorium oder städtisches Spital) und Vergleich mit den bei Erwachsenen erlangten Resultaten.

Der Umfang des Ergriffenseins ergab die am meisten genaue Auskunft von dem prognostischen Standpunkte. Unter den Fällen, wo zwei Lappen mit Kavernenbildung ergriffen waren, oder wo mehr als zwei Lappen ergriffen waren, mit oder ohne Kavernen, war kein einziger, in dem die Krankheit "gehemmt" oder "viel gebessert" wurde.

Nächst in Bedeutung war die Pulszahl. Kein Patient mit 80 oder weniger Pulsschlägen wurde schlimmer oder starb, und in keinem Patienten mit mehr als 120 Schlägen wurde die Krankheit "gehemmt" oder "viel gebessert."

HYGIENE OF THE MOUTH, NARES, PHARYNX, INTESTINE, SKIN, MUCOUS MEMBRANE IN GENERAL, LYMPH BODIES, LUNGS; THE PREVENTION OF COLDS.

By Noble P. Barnes,
Washington, D. C.

If attending to seemingly little things—things frequently neglected and things approaching godliness—is important, then hygiene of the mucous membranes must be regarded as a consequential requisite in the prevention and cure of disease.

In the first place, a mucous membrane to be clean and healthy must have free drainage. Therefore in the very beginning the adenoid vegetations and the enlarged tonsils that are present in a majority of tuberculous children must be promptly and completely removed.

Frequent tonsillotomies may to a degree relieve obstruction, but the decapitated tonsil becomes the submerged, partly concealed old fort that harbors various organisms and affords an open path for the invasion of the tubercle bacillus. Nothing short of enucleation of this degenerated and diseased structure will permit a healthy mucosa to develop at that point, and only by complete adenectomy and tonsillectomy will the turbinates become reduced to their normal size, free drainage of the nasal mucosa be established, and proper breathing maintained.

Only by securing free drainage and free air-space in the nasal cavity can we hope for the relief and cure of ear disturbances, recovery of diseased pulmonary and gastro-intestinal mucous membrane, or arrest and non-recurrence of a tuberculous process.

Having obtained these first measures, the upper air-passages will usually take care of themselves, unless a deflected septum, bony spurs, polypi, or chronically enlarged turbinates demand additional operative measures.

If the mucosa is thickened, the employment of mild alkaline antiseptic solutions, followed by mentholated albolene, will help to effect a healthy condition.

When possible, and especially in older children, laryngoscopic examinations should be made, as a local infection that might be the primary cause of the cough and hemoptysis may in this way be discovered.

Besides the usual local treatment, rest to the involved structures is imperative. In the event of an actual lesion or in simple catarrhal conditions of the air-passages nebulization with aromatic, antiseptic oils, blended to produce a pleasant and soothing effect, is of undoubted value.

The morning toilet of those who possess sensitive mucous membranes and who inhale city dust should include the employment of a non-irritating nasal douche and a cold-water gargle following the usual soap and brush to the teeth, and gradually cooling shower-bath. A free exchange of air in the lungs is next in order, the method of effecting this depending upon the physical condition, and, lastly, inhalations, for five or ten minutes, of mentholated aromatic oils.

During this time much of the mucus collected in the larynx, trachea, and bronchi will be expelled. This means better appetite, improved digestion, and less nausea from mucus-lifting after breakfast. Besides these local measures for the restoration of respiratory mucosa, the one drug, where its use is not contraindicated, that will assist in promoting a healthy condition is iron iodid, usually given in small tonic rather than alterative doses.

An active inflammatory process in any location demands rest of the affected part, and in no instance is it needed more than in a lung involved in an acute tuberculous process. Here lung dilatation as the result of exercise or high altitude will not only prevent healing and scarring and interfere with the formation of a protective membrane to institute caseation and calcification, but will favor further invasion of lung tissue and induce hemoptysis. After the inflammation has subsided and the disease has become quiescent, gradual expanding of the lung should be attempted, always under the direction of a competent observer.

If judiciously applied, physical training will yield excellent results. Removal to a stimulating climate may benefit the milder forms of the disease, but prolonged exercise or overwork may result in impairment of both lungs and body.

In practising lung gymnastics two precautions should be observed: First, never expand the chest beyond the degree of comfort, or there is danger of tearing open old wounds or of rupturing air-cells. The latter condition in itself is not infrequently followed by infection, as has been often observed in athletes. Second, expel the air through the nose instead of through the mouth or puckered lips, as is practised by most teachers of physical culture, for the reasons that the turbinates are cooled by inhalation, warmed by exhalation, and that dust caught upon the vibrissæ and mucous membrane will be blown out instead of drawn further in.

Only second in importance, and not seldom of primary importance, is the mucous membrane of the digestive tract. As has been shown in recent

experiments, it is quite as common a route for tuberculous invasion in infants and young children. Besides the organisms that may be carried to the mouth by infected food and by unclean hands and toys, the pathogenicity of the bovine tubercle bacillus in children is to-day an established fact.

Hess,[1] in reviewing the cases of primary mesenteric gland tuberculosis in which the type of bacillus has been differentiated, demonstrated that over 60 per cent. have been caused by the bovine type. Among children this type greatly prevailed, whereas in adults the majority of infections were with the human variety. There is strong evidence that these organisms are as similar as the different families of the human race, and are only altered by environment. In this event most tuberculous infection must occur during the milk-feeding age.

Certainly the only rational method of keeping the digestive tract clean is to prevent the introduction of infection. The milk may either be pasteurized and the organisms destroyed, preferably by a process of lower temperature and aëration, or, as suggested by Gunn,[2] a breed of cattle that is immune to tuberculous disease may be reared. We can give sterile animal broths and other foods that we know to be clean; all this is "love's labor lost" unless we can prevent the numberless methods of infections that come from a lack of correcting the little things.

The abominable pacifier, rubber or rag, is in the nurse's or mother's mouth, then in the baby's, then on the floor, and again in the baby's. In this cycle the child can receive into its digestive tract thousands of organisms. Furthermore, by the sucking of these articles the mouth and palate may become deformed, a constant hyperemia, congesting the post-nasal and tonsillar glands is present, producing the adenoid vegetations, and, lastly, the habit of having something in the mouth is created. Thus by the time the child is old enough to walk, and up until school life, all manner of things, from strings to pennies, find a resting-place in the mouth, usually inserted there by dirty fingers. From school life on this habit continues, and gum-chewing, "all-day suckers," pencil-wetting, and nail-nibbling are the result.

When we are confronted with an infected digestive mucosa, we must, in a great measure, depend upon the hydrochloric acid of the stomach. If it is deficient, we must supply it. This acid is nature's antiseptic for the stomach, and stimulates the flow of nature's intestinal antiseptic, the bile. Internal antiseptics should be administered to these cases, as well as to those who are too young to prevent the secretions from the respiratory membrane from slipping into the stomach.

Another evidence of neglect in the little things concerning the growing child is the lack of attention that is paid to the teeth. Practically all

children for a considerable period absorb into their lymph-channels and carry into their stomachs hosts of organisms. Decaying teeth should be cleansed and filled or extracted. The popular belief that the first teeth must not be disturbed for fear of interfering with the second set must be dispelled.

There is just one thing to do with tuberculous lymph bodies, when they can be reached; and that is to effect prompt and complete removal of the chain. Seventy-five per cent. of school-children will exhibit enlarged lymphatics, due to excessive metabolism, but these can be reduced by diet, hygiene, and proper medication. Sodium salicylate and iron iodid are appropriate remedies.

Wilder[3] states that "the earlier statistics as to frequency of tuberculosis of the eye must be regarded as rather misleading"; as Groenouw suggests: "With a growing knowledge of the subject the number of cases of tuberculosis of the eye is naturally increasing. Brejski holds that 10 per cent. of cases of parenchymatous keratitis are tuberculous. Diez[4] estimates the percentage as high as 50. Haas claims that as high as 50 per cent. of all cases of iritis are tuberculous. Many observers, like Greef, Mickel, and others, find by histological examination evidence of tubercle in the uveal tract that was not apparent during life." This suggests the need of a prophylactic eye toilet, which can be carried out with the usual morning and evening washings, and consists of the application of non-irritating antiseptic lotions by means of the convenient eye-cup.

Ear infection usually occurs from within, being an extension of inflammation from the nasal cavity, due to lack of drainage and air-space. When these faults are corrected, and cleanliness of the external auditory canal is maintained, further trouble will be avoided. Examination of the infant's ear should be a routine procedure. If this is not done the careless observer may overlook a beginning otitis and treat the baby for almost anything, from colic and bronchitis to perverted disposition and meningitis.

To do the things that have here been enumerated; to keep the mucous membranes clean and healthy, means in itself one of the first steps toward preventing the so-called "taking cold." The expressions "catching cold," "cold in the head, chest, or back," mean absolutely nothing to the trained mind. If the mucous membranes are free, open, well drained, and healthy, there will be no army of organisms waiting for a lowering of resistance by exposure to atmospheric changes, fatigue, or hunger to operate in the production of a rhinitis, bronchitis, follicular tonsillitis, or rheumatism

In addition to the hygienic measures mentioned a considerable degree of resistance can be established by proper bathing. The usual hot bath must be discontinued. The tepid, gradually cooling shower, accompanied by friction, is to be preferred. The temperature should depend upon the

individual case, and should be lowered only to the point of getting good reaction.

In short, the measures to be instituted in order to obtain the desired result, namely, the "prevention of colds," are as follows: Proper hygiene of the skin and mucous surfaces; proper hygiene in diet, sleep, and living; avoidance of fatigue, prolonged hunger, mufflers, chest protectors, dust, and poorly ventilated surroundings.

Churches, theaters, and even schools are often filled with hot, germ-laden air; and the truant, though regarded as a bad boy, must be credited with good sense in that he prefers the open air. No exercise in the play park can overcome the injury that accrues from studying in foul-aired school-rooms or sleeping in closed apartments. Nor can fresh air and good food overcome disease caused by defect.

The new hygiene of to-day should be taught in the school; this does not mean that most stress should be laid on the effect of tobacco and alcohol, but that the student should be taught that the avenues of infectious diseases are through the skin and mucous membranes, and that, consequently, these must be kept clean and healthy.

BIBLIOGRAPHY.

1. Hess: Amer. Jour. Med. Sci., August, 1908.
2. Gunn: Brit. Med. Jour., February 15, 1908.
3. Wilder: Jour. Amer. Med. Assoc., vol. xxv.
4. Diez: Zeit. f. Augenheilkunde, 1899, 435.

THE EXPECTANT TREATMENT OF PULMONARY TUBERCULOSIS—A CONTRIBUTION FROM ORTHOPEDIC SURGERY.

By Adoniram B. Judson, M.D.,
New York.

The doctrine derived from the study of orthopedic cases is that tuberculosis in the joints owes its destructive character to unfavorable environment and not to an inexorable disposition of its own, which doctrine may be extended to read that patients affected with tuberculosis of the lungs will recover without treatment if their environment is favorable.

Aside from whatever infective quality it may have, tuberculosis of the joints, the worthy rival of infantile paralysis in the production of lameness, is clinically the expression of a conflict between destructive and reparative forces. After a period of advance, the disease retreats. The cause and method of this benign change are not understood, but the surgeon, encouraged by the certainty of its coming, invites its approach by mechanically protecting the affected part and providing the best possible general environment. This he will continue to do until the nature of the trouble is understood. When knowledge of the tuberculous process leads to its arrest and prevention, a portentous medical riddle will be solved.

In all sections of the Congress pulmonary tuberculosis will be very much in the minds of our colleagues as the chief burden of their professional lives. In the wide range of general medicine it stands out in baleful perspective. The same distinction is held in the limited field of orthopedic surgery by hip disease. If nothing can be done to promote recovery from hip disease except to correct faulty environment, it will be but a step further to say the same of pulmonary tuberculosis.

The tuberculous hip has been intractable to all forms of positive treatment. Medication has not been neglected. New devices of minor surgery are constantly in the stage of experimentation. New mechanical methods have been counted by the hundreds, and operative surgery has been pushed to the extreme. Although patients have, almost without exception, recovered, curative treatment has not been found, and the often disappointed observer, led by reason and experience, relies confidently on expectant treatment. He provides a local environment that frees the affected part

from disturbance, and seeks a general environment that includes abundant food, innocuous occupation, and sanitary housing. The patient is thus assured of recovery with the least inconvenience and the best result allowed by the nature of the case.

Can pulmonary tuberculosis be viewed in the same therapeutical light? It may be said that as one is fatal and the other not fatal, recovery from both cannot be expected to follow the same line of treatment. Sir Benjamin Brodie said: "Why should hip disease be dangerous? The hip is not a vital organ," and Dr. Henry G. Davis, the leader of the modern renaissance of orthopedic surgery, wrote: "Medical men are convinced that when consumption has once taken possession, it goes not out until the spark of life goes with it."*

The parts affected have, however, peculiarities of anatomy and physiology that make it reasonable to believe that the treatment accorded to one may be applied, *mutatis mutandis*, to the other. The lung is a semi-detached, almost pedunculated organ. The hip is an inherent part, interlocked with other parts of the body by far-reaching and rigid processes. The construction of the lung is simple; that of the hip, complex and jointed. Lung tissue is soft and homogeneous, completing development with the cry of the new-born, whereas the tissues of the hip range from hardest bone to impalpable synovial membrane, and reach development in late adolescence. The vascular network of the lung invites infection and encourages repair, whereas the hip, with its comparatively deficient circulation, reluctantly yields to disease and reacts so slowly that a typical case of hip disease covers several years.

If the hip rises superior to tuberculous infection, what forbids the expectation of signal recovery in the lung, so separate from the rest of the body, so simple in construction, with rapidly developing, homogeneous, and plastic tissue, so infused with vascularity, and altogether so alert and responsive to the appeals of disease and recovery? And the factor of safety is to be considered. If both lungs were seriously impaired, the case would be fatal; but when it is known that with only part of a lung life may be indefinitely prolonged, who can put a limit to recovery in a favorable environment?

It will be in order to note the environments required in hip disease and consumption respectively. A therapeutical precept, followed alike by nature and art, is the arrest of the function of an inflamed organ. This is especially applicable to the hip endowed with wide and active motion, and no less applicable to the lungs, which are in constant motion. The

* "Conservative Surgery," 1866, p. 284. Reprint from same, "The Curability of Pulmonary Consumption," p. 4. His views, except in their optimism, have little in common with those presented here.

arrest of motion that is sought in the tuberculous hip by fixation may be sought in the tuberculous lung by the omission of exercises that unduly quicken the breathing and circulation, and by keeping respiration at the minimum, as is seen in healthy sleep. The possible volume of respired air is a useful provision for emergencies, but is not always necessary for health and recovery. It is a unanimous opinion that the seat of inflammatory action must be protected from violent disturbance. This protection is sought in the hip by recumbency or the use of portable apparatus, and may be sought in the diseased lung by the cessation of coughing.

The interesting question arises whether coughing can be arrested or prevented. The impulse comes from a congested point where an adhesive exudation promptly appears. Coughing destroys this protection, and a semifluid secretion soon calls for renewed efforts, attended by temporary and doubtful relief and certain injury to membranes in a state of subacute inflammation likely to become chronic. Coughing increases the irritation, and the irritation in turn increases the cough. This is a vicious circle, and certainly suggests the intervention of reason and self-control. That the lungs are exposed to the risk of injury is clear on a consideration of the mechanics of this muscular convulsion. On occasion the thoracic and abdominal muscles act as expulsive organs, and when they respond to an impulse to cough, their great power is displayed in severe compression, alternating with sudden release and agitation of the whole respiratory apparatus, whereas the compressed air driven through the tubes recalls the action of a steam pencil, wanting only the mordant agent to become an excoriating sand-blast.

It may not be doubted that intelligent effort will in a measure overcome this habit, and in many cases lead to its cessation. It is not easy to ignore laryngeal irritations and temptations to cough, and to give up what one has been accustomed to for years. Reform is a tedious process, because it takes longer to go up hill than down. Neither is it altogether frivolous to say that if you do not cough the first time, you do not have any cough. Expectoration, when imperative, may be facilitated by assuming for a moment an attitude in which the direction of the air-passage is changed from the vertical to a downward inclination, when gravitation and a little effort provide a harmless exit. In such straits quadrupeds, with their inclined wind-pipes, have an advantage, as was seen during the epizoötic that afflicted American horses in 1872.

The local treatment of pulmonary tuberculosis, based on orthopedic practice, may be outlined as follows: (1) The omission of whatever unduly excites respiration and circulation; (2) the habitual reduction of the volume of respired air to the minimum; (3) the inhibition of coughing.

Turning now from local to general considerations, it is evident that a

favorable general environment should be accorded equally to the hip patient and to the consumptive, and, indeed, in view of prevention, to every member of the community. The question of how to distribute evenly the advantages of abundant food, innocuous occupation, and sanitary housing is calling for quick attention.

In passing, I suggest the possibility of relaxing the custom that regulates the hours of taking food. Is it wise to eat three meals at short intervals and then give a long interval to fasting? An old custom of the navy called for the "meal pennant" at 8 bells. Thus the men had breakfast at 8 o'clock, dinner at 12, and supper at 4. Three meals within eight hours were followed by a fast of sixteen hours. The efficiency of the ship's company may not have been appreciably reduced, but a more reasonable dietary would have observed an even distribution and the omission of fasting. In this connection the method of the machinist, when he gives fuel to his engine, may be recalled, and the rules that govern feeding in the nursery and the typhoid ward.

It has been said that prevailing east winds and atmospheric moisture are less potent as factors of pulmonary tuberculosis than is parsimony. Tuberculosis of the joints is especially a menace to childhood, and yet in this period, when the vital processes are at their best, and growth and development are active, it seems that natural resistance to general disease should be alert and give protection from dangers of this kind. In early youth the circulation is rapid and full. Children are not easily deprived of their share of respiratory activity. They are not given to introspection and melancholy, which have been thought to favor the approach of general or constitutional diseases. Their habits are far from sedentary. Their minds are free from worry, and their bodies from overwork and long hours, without rest and recreation. By this process of exclusion their danger may perhaps be traced to some mismanagement of alimentation.

Some unfortunates are, from sad necessity, denied sufficient food. Others perhaps suffer because prudent economy finds easy expression in a scanty allowance to the younger members of the family, reinforced by a common and not altogether unreasonable belief that it is bad for a child to eat too much. Overeating may, of course, induce acute disorders of brief duration, but, on the other hand, this sort of prudence may easily lead to the more serious mistake of opening the door for chronic affections by withholding sufficient nourishment. Certain young parents who have no reason for economy seem to have an idea that the precious object intrusted to them has delicate and sublimated qualities that, for a time at least, exempt it from the common necessity of an abundance of good food.

Without experience in diseases of the lungs, I am not so presumptuous as to claim too much for the therapeutical concept included in this article,

but logical inferences, unsupported by experience, may prove to have practical value, and the argument here ventured will not be in vain if it throws a single ray of light on a most important subject.

The prevention of disease is a desideratum that, when acquired, gives to the physician the greatest pride and delight. Next to that comes the satisfaction of recognizing and providing for the miracle of recovery by expectant treatment. It may be asked what will be the status of the medical profession when prevention and expectation shall have reached the beneficent extremes so eagerly anticipated. The medical student, if he has time to read these remarks on pulmonary tuberculosis, will say: "But where does the physician come in?" My young friend, he is not coming in. His successor, say, fifty years from now, may be the trained nurse. The physician may then be found in the State laboratory, making a diagnosis, or perchance prescribing absent treatment for the Martians.

Contribución de la Ortopedia Quirúrgica al Estudio de la Tuberculosis. —(JUDSON.)

Se avanza la proposición que los pacientes afectados de tuberculosis pueden recuperar y que nuevos casos pueden prevenirse si el medio ambiente, local y general, es favorable. El argumento se relaciona con la comparacion de dos formas comunes de la infección: tuberculosis de la articulación de la cadera y la tisis. El principio de que la primera puede recuperar sin tratamiento especial, sino simplemente por medio del mejoramiento del medio ambiente, es derivado de la clínica y de la literatura. Se sostiene que si la tuberculosis de la articulación de la cadera es capaz de recuperar, bajo un punto de vista de la Anatomía y Fisiología comparada de la articulación de la cadera y del pulmon, que los mismos, sino mejores resultados, pueden obtenerse en la tisis. Se expone un medio ambiente correcto para la tisis. Es admitido que al presente es imposible proveer para todos, el enfermo y el sano, el medio ambiente deseable, lo cual incluye abundancia de alimentos, ocupaciones inocuas e higiene en las habitaciones, mas las observaciones sobre la enfermedad de la cadera demuestran que el descanso local debe procurarse en la tisis por medio de la respiración superficial, sesación de la tos y evitar el ejercicio que acelera la respiración.

Une contribution de la chirurgie orthopédique à l'étude de la tuberculose. —(JUDSON.)

On avance la proposition que les malades atteints de la tuberculose guérissent et ne subissent pas de rechute si l'environnement local et général

est favorable. L'argument se réduit á une comparaison entre deux formes très communes de l'infection, la tuberculose de la hanche et la tuberculose des poumons. Le fait que la première forme se guérit sans traitement excepte par correction est basé sur des expériences de cliniques et sur des publications médicales. On prétend alors que si la tuberculose de la hanche se guérit ainsi, l'anatomie et la physiologie comparées du poumon et de la hanche fournissent des raisons suffisantes pour l'opinion que des résultats semblables ou même meilleurs se produiront dans les cas de tuberculose des poumons. L'auteur expose un plan d'entourage correct pour les poitrinaires. Il admet qu'il n'est pas possible à présent d'obtenir pour tous, malades et bien-portants, l'entourage général désiré, qui comprend entre autres une nourriture abondante, une occupation inoffensive et une habitation sanitaire; mais les observations faites dans les cas de maladie de la hanche indiquent qu'un repos local devrait être obtenu dans la tuberculose des poumons par une respiration superficielle, par la cessation de la toux, et en évitant les exercises qui hâtent la respiration.

Ein Beitrag aus der orthopädischen Chirurgie zum Studium der Tuberkulose.—(JUDSON.)

Es ist die Voraussetzung vorgeschritten, dass von Tuberkulose befallene Patienten genesen werden und dass neue Fälle nicht vorkommen werden, wenn die örtliche und allgemeine Umgebung günstig ist. Die Beweisführung ist zu einem Vergleiche zweier gewöhnlicher Formen der Infection, der Hüfterkrankung und der Schwindsucht, zusammengebracht worden. Die Constatirung, dass die erstere ohne Behandlung, ausgenommen Verbesserung der Umgebung, zur Genesung führt, ist klinisch und von der Literatur abgeleitet worden. Es wird behauptet, dass wenn die Hüfterkrankung besser wird, dass Gründe in der vergleichenden Anatomie und Physiologie der Lunge und Hüfte vorhanden seien, um den Glauben zu rechtfertigen, dass dieselben und sogar bessere Resultate bei Schwindsucht folgen werden. Eine richtige Umgebung für Schwindsucht ist skizzirt. Es wird zugegeben, dass es gegenwärtig nicht möglich ist, für alle, Gesunde und Kranke, die angestrebte allgemeine Umgebung zu sichern, welche ausreichende Nahrung, unschädliche Beschäftigung und gesundheitsgemässes Wohnen in sich schliesst, aber die Beobachtungen bei der Hüfterkrankung zeigen an, dass bei Schwindsucht örtliche Ruhe gesichert sein sollte, durch oberflächliches Athmen, das Aufhören des Hustens und das Vermeiden von Leibesübungen, die die Athmung beschleunigen.

THE SEASHORE AND FRESH AIR TREATMENT AT SEA BREEZE HOSPITAL

OF TUBERCULOUS DISEASE OF THE BONES, JOINTS, AND GLANDS OF CHILDREN.

By John W. Brannan, M.D.,
New York.

At the last International Congress on Tuberculosis, held in Paris three years ago, the subject of marine sanatoriums for tuberculous children occupied an important place in the proceedings. Exhaustive reports were presented by Armaingaud, of Bordeaux, and D'Espine, of Geneva, and the Section on Tuberculosis in Children gave an entire morning to the discussion of the reports. When we consider that there are upwards of seventy-five such sanatoriums on the various sea-coasts of Europe, one of them, Berck, having been established in 1861, it is easy to understand why they were thought worthy of so much attention. Armaingaud had collated the French statistics, and stated that in France alone 60,000 children suffering from tuberculosis of the bones and glands had been treated in seaside sanatoriums since 1887, with 59 per cent. of cures and 25 per cent. of cases decidedly improved, making in all 84 per cent. of favorable results. The percentage of cures varied from 32 in Pott's disease to 74 in glandular tuberculosis. Investigations by several independent observers showed that in about three-quarters of the cases the cures were permanent. According to D'Espine, the reports from other countries were equally encouraging, whether the sanatorium was located on the Baltic, the North Sea, the Mediterranean, the Adriatic, or the Atlantic Ocean. The conclusions of the Congress were that the seashore offered special advantages for the treatment of non-pulmonary tuberculosis in children, and that the number of marine sanatoriums should be increased as rapidly as possible.

Among the papers presented at the Section on Tuberculosis in Children was one giving an account of the experience at Sea Breeze Hospital during the first fifteen months of its existence. It is my purpose to-day to continue this report to the present time, covering a period of somewhat more than four years. For the sake of clearness it will be necessary to include a brief summary of the early history of the institution.

In June, 1904, the New York Association for Improving the Condition of the Poor, impressed by the favorable results obtained at Berck and the other marine sanatoriums abroad, decided to establish a similar hospital at its summer home, Sea Breeze, on the beach of Coney Island. At the request of the Association Mr. John Seely Ward, Jr., one of its Board of Managers, had visited the sanatorium at Berck while traveling in Europe during the summer of 1903. It was Mr. Ward's favorable report on his return that led the Association to begin its experiment the following year. No building being immediately available, a tent camp was constructed, of sufficient size to accommodate about 45 patients. During this summer there were under treatment sixty-three children, who came either direct from their homes in the tenements or from the different orthopedic hospitals of the city. They comprised cases of tuberculous disease of the spine, of the hip, knee and other joints, as well as eight cases of tuberculosis of the glands. No attempt was made at selection. The disease was in an advanced stage in the great majority of the cases. The general severity is indicated by the fact that of the 63 patients, 28 had (on entrance) one or more open, discharging sinuses. Throughout the summer the children passed the entire twenty-four hours in the open air, by day on the beach or in rainy weather on a covered platform open on all sides, by nights in tent widely open at the ends, and with windows on both sides and in the roof. The patients were bathed in the sea every day and many of them soon learned to take care of themselves in the water.

Improvement began in the children at once. When they came, most of them were pale, languid, rather fretful, with uncertain appetite, and with a disinclination to play or even to talk. Within a week their spirits revived; they slept soundly, awoke with an appetite, and were ready to join in play. Their circulation became stronger, their cheeks were reddened by the exposure to the sun, and the gain in weight was almost constant.

When the autumn came and the children could no longer be kept in tents, it was decided to take one of the buildings of the summer home and make it over for hospital purposes. This building, being detached from the others and furnished with wide, open porches and many windows, lent itself admirably to the purpose. The partitions between several rooms were removed and four dormitories were thus provided, sufficient to accommodate about forty-five children. The entire expense of the alterations, including the installation of a steam-heating plant, was under $2000.

It was with considerable misgiving that we undertook to continue the open-air life of the children throughout the winter, though convinced that only by so doing could we maintain the improvement that had been made during the summer. The outdoor treatment of pulmonary tuberculosis in the adult had been accepted by the general public as well as by the medical

profession, but to submit delicate children to the same conditions may well have seemed unwise to many. But our courageous superintendent, Miss Alice Page Thomson, after a visit to Dr. Trudeau's sanatorium at Saranac, instituted an open-air régime, which has been followed rigorously and advantageously ever since. The children are kept in the open air throughout the twenty-four hours, and throughout the entire year. As soon as breakfast is over the bed-cases are carried out and placed in cribs on the open porches, which give right on the sea to the south. There they remain until sundown. The children that can walk, amuse themselves on the beach or on the piazzas, coming in only for meals, or for the one or two hours' rest and instruction which those of the school or kindergarten age receive, and which is given in a large, well-ventilated room.* At night the windows of the wards are wide open, even through the winter, being closed only for a half hour in the morning and evening when the children are being washed and dressed. The temperature in the wards differs but little from that out of doors, varying in the winter from ten to forty degrees above zero. The children are clothed in flannel and wear warm hoods and mittens. There has not been a day during the four years when they have not been out of doors for at least a part of the twenty-four hours. We have learned that it is as important in bone tuberculosis as in pulmonary tuberculosis that the patient should spend his entire time in the open air, and also that it is in cold weather that he makes the greatest gain.

The diet is nourishing and abundant. The following is an average daily bill of fare:

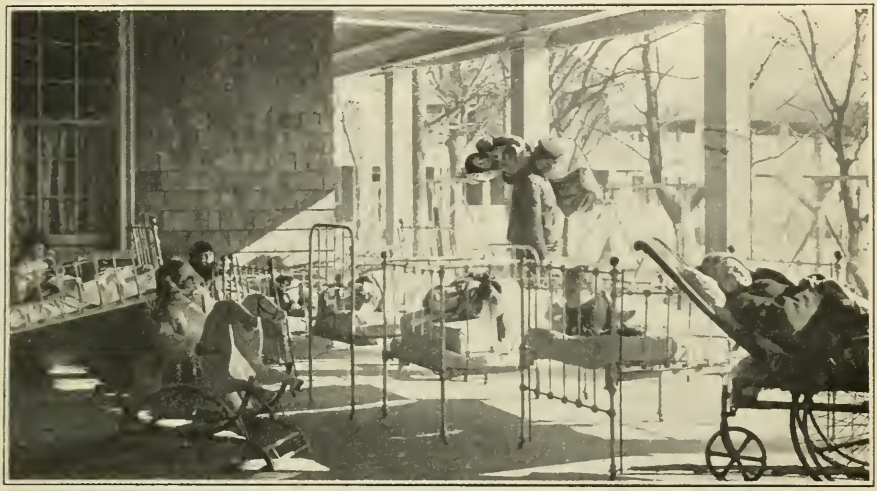
Breakfast: Farina, with milk, two helpings. Toast with chicken gravy. Bread and butter, two to four, or even five slices. One or two glasses of milk.

Dinner: Roast beef; mashed potatoes; fresh string-beans; bread and butter, two or three slices; sago pudding; milk, one to two glasses.

Supper: One egg; buttered toast, two to five slices; stewed peaches, milk as at breakfast. In addition the children have a light luncheon of crackers and milk at ten o'clock, and fruit or crackers and milk at three o'clock in the afternoon.

This diet table, as may be seen, is not arranged scientifically, but is prepared by our superintendent, who, in addition to having great ability as an executive, is also an excellent cook. One is naturally struck with the very large amount of food the children eat, and yet it cannot be called forced

* As soon as it had been decided to keep the children through the winter, steps were taken to secure a teacher from the Board of Education, which has kindly coöperated with us in this important matter and has supplied not only teachers but also a kindergartner. Many of the children had had no schooling whatever when they came to the hospital.



feeding, if we are to understand by this term food that is forced upon the patients.

A rough calculation of the heat values of the food consumed in one day by each child comes to about 2500 calories. As the weight of the children does not average more than twenty kilos, this gives to each child about 125 calories per kilo—an amount greatly in excess of what is usually given in sanatoriums to patients suffering from pulmonary tuberculosis. The ability of the children to eat and digest and assimilate so much food is probably due to their living in the open air throughout the twenty-four hours. The appetizing manner in which the food is cooked and served counts for much. It is probable also that the digestion of a child suffering from surgical tuberculosis is not so easily disturbed as that of a person suffering from pulmonary tuberculosis.

I have spoken of the rapid progress in the general condition of the children, as shown in their appearance, their circulation, their spirits, their appetite, their sound sleep, and their gain in weight, all beginning at once with their coming to the seashore. The improvement in the local lesions has naturally been slower in manifesting itself, but in almost all cases it has appeared in a surprisingly short space of time. The quick and permanent closing of sinuses is very striking, especially under the direct influence of the salt water, as shown in the following instances:

Mariano A., thirteen years old, was admitted in June, 1904, with a tuberculous ankle-joint. The disease began in 1898, and there was a history of four operations in Italy and one in New York. On admission there were two deep sinuses, one over each malleolus, with considerable discharge. The boy, though quite lame, walked about, going into the ocean daily and coming out with the wounds packed with sand, much to the distress of the nurses. Nevertheless the discharge diminished and by the autumn had entirely ceased. In February, 1905, both sinuses had closed, and the boy was ultimately discharged with the joint anchylosed at an angle of 95 degrees and able to walk and play with no noticeable lameness.

The other cases were among the children who had daily baths during the past summer. My attention was called to them by Miss Josephine F. W. Brass, the efficient and observing head nurse of the hospital. One was a case of hip disease with two sinuses, one of disease of elbow with two sinuses, and one of disease of elbow and hand with three sinuses. They went into the water dressings and all, the wet dressings being afterward replaced with dry ones. Under this treatment all of the sinuses have closed completely since the first of July.

It is not my intention to describe in detail the surgical treatment of the children. That it is of the best must be apparent from the results. Even residence at the seaside under the conditions above outlined does not enable

us to dispense with skilful orthopedic care. Serious operations are rare, but when performed, they are attended with less depression than is usual in children. In fact the rapid progress after operation is one of the most characteristic features of the open-air treatment at the seashore. Dr. Leonard W. Ely, the attending surgeon, and Dr. Brainerd H. Whitbeck, his assistant, have been prompt in recognizing the moment for a change in treatment, and have replaced the brace or extension frame with the plaster jacket or the spica, so as to get the patient up and about as soon as possible.

The table prepared by them gives in detail the results in the 136 patients that have been admitted to the hospital from its opening down to the 31st of July of this year. The grave character of the cases is at once apparent from the table. In 68 patients, exactly one-half, the spine or the hip was involved; and in 55 of these, or 81 per cent., the disease was in an advanced stage at the time of admission to the hospital. The significance of these figures must be apparent to all, for Pott's disease of the spine, and tuberculous disease of the hip, when of long standing, are among the most formidable affections that the surgeon is called upon to meet. In seeking to know the final results of the treatment, we are obliged to limit ourselves to those cases whose history is complete, that is, the discharged cases. The table shows that of the 19 patients with Pott's disease, 26 per cent. were cured and another 32 per cent. improved, making 58 per cent. that were either well or progressing to recovery when they were discharged. Of the 23 cases of hip disease, all of them advanced, 43 per cent. left the hospital absolutely cured, and 9 per cent. improved, or 52 per cent. in all of *successes*, as the French term it. Orthopedic surgeons will appreciate the significance of these results.

Among the discharged cases there were 22 in which the knee or other joint was affected. Over 81 per cent. of these were in an advanced stage, and yet an average of 73 per cent. were cured, and 13 per cent. more improved, showing the relatively good prognosis of the disease when located in these joints, as compared with tuberculosis of the spine or hip. Of the 32 cases of glandular tuberculosis, 85 per cent. were either cured or improved, a very satisfactory result. As stated in note 4 of the table, in 13 patients more than one part of the body was involved. Further proof of the average severity of the tuberculous process in the cases admitted to Sea Breeze is furnished by the fact, noted in the complete records of cases, which will be found at the end of this pamphlet, that of the 136 cases 65 had one or more open sinuses, amounting to 139 sinuses in all.

On July 31st of this year, there remained in the hospital 34 children, and of these all but 8 were cases of spinal or hip disease, of which more than two-thirds were in an advanced stage.* The surgeons, however, reported that

* See Note 2, Table I.

all were improving and that many might soon be discharged cured. Of the 34 cases, 21 were confined to bed. To-day (October 1st), three months later, only 14 are in bed, 7 having been fitted with plaster jackets and sent to join the other children at play. The accompanying photograph shows five of these children, four of them wearing the Calot jacket, which Dr. Ely has found of such great service during the past year. The present census of the hospital is 39, five new cases having been admitted since July 31st, only two of them in an advanced stage, though all are cases of undoubted tuberculosis of the bones or glands. The surgeons state that it is the present policy of the hospital to accept and retain only such cases as show a prospect of being cured.

What of the future of Sea Breeze Hospital? It is well understood by its friends that it was established only as a temporary experimental hospital to test the seashore and open-air treatment of non-pulmonary tuberculosis in children. The original purpose of the tent camp has been accomplished. It has been demonstrated that to obtain the best results in the treatment of bone and gland tuberculosis it is essential that the patient should spend his entire time in the open air.* In addition it has been shown that the seashore offers especial advantages for outdoor life in this variety of tuberculosis. That these views are not confined to those immediately connected with the hospital is proved by the fact that subscriptions to the amount of $250,000 have been received by the New York Association for Improving the Condition of the Poor for the erection of a permanent hospital, and by the additional fact that the city has agreed to provide a site at the seashore for the erection of the hospital and to accept and maintain it when completed. In March, 1907, after prolonged consideration and the holding of a largely attended public hearing on the subject, the Board of Estimate and Apportionment resolved by a unanimous vote to purchase Rockaway Beach for the purposes of public health and recreation. A portion of the beach, to be selected by the Association, was to be set aside as a site for the hospital. Condemnation proceedings for the acquisition of the property were duly authorized, and instituted during the summer. But in the autumn came the stringency in the money market, and, in common with other measures of importance to the welfare and development of the city, the proceedings were arrested by those responsible for its financial credit. This delay, though much to be deplored, is, we believe, only temporary, as we have full confidence that at the earliest possible opportunity the municipal authorities will redeem their pledge to the Association and to the 4000 crippled children of New York city.

* "It is a great mistake to keep children with bone tuberculosis in the wards of a city hospital. We have learned that the ward is not the place for pulmonary tuberculosis, no more is it the place for bone tuberculosis."—Dr. John H. Lowman, Transactions of the National Association for the Study and Prevention of Tuberculosis, volume ii, May, 1906, page 636.

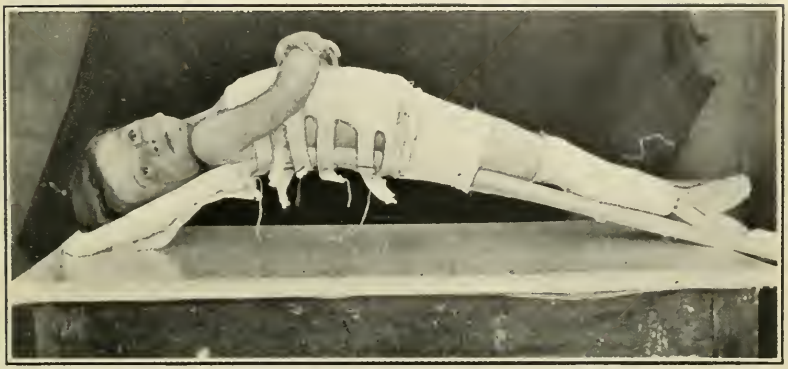
TABLE I.—SEA BREEZE HOSPITAL. SUMMARY OF CASES JUNE, 1904 TO JULY 31, 1908.

Discharged Cases.

Cases.	No.	Per Cent.	Cured.		Improved		Unimp'ed.		Died in Hospital.	
			No.	Per Cent.	No.	Per Cent.	No.	Per Cent.	No.	Per Cent.
Spine										
Early	5		1		2		2		..	
Advanced	14		4		4		5		1	
Total	19	19	5	26	6	32	7	37	1	5
Hip										
Early	..		..		..		..		..	
Advanced	23		10		2		8		3	
Total	23	22	10	43	2	9	8	35	3	13
Knee										
Early	3		3		..		..		..	
Advanced	6		4		1		1		..	
Total	9	9	7	80	1	10	1	10	..	..
Other Joint										
Early	1		1		..		..		..	
Advanced	12		8		2		2		..	
Total	13	13	9	70	2	15	2	15	..	..
Gland										
Early	9		4		5		..		..	
Advanced	24		10		9		5		..	
Total	33	32	14	42	14	43	5	15	..	..
Syphilis										
Early	1		1		..		..		..	
Advanced	4		3		1		..		..	
Total	5	5	4	80	1	20	..	..	..	..
Grand Totals	102		49	48	26	26	23	22	4	4

Note 1.—Of the 23 unimproved cases 18 have died since discharge, from various complications, among which may be mentioned:

Amyloid degeneration of viscera	6
Pulmonary tuberculosis	4
Hypostatic pneumonia	2
Meningitis	1
Nephritis	1
Multiple sarcoma	1
Causes unknown	3
Total	18



NOTE 2.—In addition to the 102 discharged cases there were in the Hospital on July 31, 1908, 34 cases as follows:

	EARLY.	ADVANCED.	TOTAL.
Spine	5	10	15
Hip	3	8	11
Knee	1	3	4
Other joint		1	1
Gland	1	2	3
Total	10	24	34

These 34 cases are all improving and many may soon be discharged, cured. At the outset the Hospital admitted many far advanced cases even when the prognosis was hopeless. The present policy of the Hospital is to accept only such cases as show a prospect of being cured.

NOTE 3.—The above 102 cases had many complications, among which were the following:

Syphilis	10
Pulmonary tuberculosis	6
Amyloid degeneration of viscera	6
Diphtheria	3
Hypostatic pneumonia	2
Otitis	2
Nephritis	1
Keratitis	1
Multiple sarcoma	1
Hodgkin's disease	1
Total	33

NOTE 4.—More than one part tuberculosis:

Spine, knee	1
Spine, gland	2
Spine, hip	1
Spine, jaw, elbow	1
Spine, jaw	1
Spine, elbow	1
Hip ankle	1
Hip, elbow	1
Knee, elbow	1
Rib, finger	1
Finger, gland	1
Orbit, rib, gland	1
Total	13

NOTE 5.—Tuberculous ancestry:

Father and mother both died	1
Father died	4
Father ill	11
Mother died	4
Mother ill	2
Other relatives ill	7
Total	29

TABLE II.—SEA BREEZE HOSPITAL. RECORD OF CASES FROM THE OPENING, JUNE, 1904 TO JULY 31, 1908.

No.	Name.	Age, Years.	Hosp. Days.	Ill Before Admission, Years.	Condition When Admitted.		Weight.				Lesion.			Complications Other Illness.	Tuberculosis in Family.	Condition of Patient.		Died.	
					General.	Local.	Admiss.		Disch.		Spine.	Hip.	Joint.	Gland.			In Hosp. July 31, 1908.	At Time of Discharge.	In Hosp.	Later.
							lb.	oz.	lb.	oz.										
1	Edward G.	9	34	3	Fairly well nourished.	Wound from operation healing well.	61	0	61	8				1				Cured—wound healed.		
2	Jacob W.	9	134	5	Well nourished; walks lame, wears knee splint.	Left knee enlarged, slightly; no pain on motion.	58	0	60	0			Knee.					Cured.		
3	Antoinette S.	11	121	1	Well nourished; walks as if hip were dislocated.	A node in rt. cervical region removed by operation.	84	8	78	0				1				Improved.		
4	Sollie P.	6½	23	1	Well nourished, good color.	Wears hip splints on right thigh.	54	0	53	8		Right			Diphtheria.			Fine, no sign of hip disease, original diag. doubtful.		
5	Francis P.	4	18	?	Very poor.	One sinus.	33	8	33	0				1	Pulmonary tub.			No improvement.		1
6	Bessie O'B.	13	366	½	Anemic.	Two sinuses.	77	0	101	12				1	Syphilis, tertiary; pulmonary tuberculosis.			Much improved.		1
7	Bessie O'C.	6	125	½	Anemic, poorly nourished.	Submaxillary gland enlarged; red, indurated, soft in center.	37	8	39	8				1				Cured.		
8	George L.	2½	798	1	Anemic, does not walk.	Enlarged lymph-nodes in rt. cervical region; soft, puffy swellings.	16	11	26	0				1		Mother died.		Cured.		
9	Joseph L.	9	58	1	Well nourished, good color.	Wound in left side of neck for removal of tub. lymph-glands.	56	0	59	0				1				Good health, wound almost healed.		
10	James L.	11	37	⅓	Ill nourished, hardly able to walk.	Cervical nodes enormously enlarged.	63	0	57	12				1	Hodgkin's disease.			Much emaciated, almost wholly unconscious, little improvement.		1
11	William H.	10	139	4	Anemic.	One discharging sinus.	62	8	64	12				1				Improved.		
12	George G.	9	499	2	Fairly well nourished.	Four discharging foci in l. cervical region; much inflammation	53	0	61	0					Syphilis.			Cured.		

TABLE II.—SEA BREEZE HOSPITAL. RECORD OF CASES FROM THE OPENING, JUNE, 1904, TO JULY 31, 1908.—(*Continued.*)

No.	Name.	Age, Years.	Hosp. Days.	Ill Before Admission, Years.	Condition when Admitted.		Weight.			Lesion.				Complications. Other Illness.	Tuberculosis in Family.	Condition of Patient.		Died.	
					General.	Local.	Admiss.	Disch.		Spine.	Hip.	Joint.	Gland.			In Hosp. July 31, 1908.	At Time of Discharge.	In Hosp.	Later.
							lb. oz.	lb. oz.											
13	Florence H.	7	1310	3	Anemic; wears corset with jury-mast.	Enlarged lymph-nodes at lower maxillary bone.	33 3	34 8							Uncle.		Poor; unimproved.		1
14	David G.	10	843	7	Badly nourished; anemic; walks with crutches wears brace.	Hip suppurating extensively; several sinuses.	50 8	50 0			Left.			Hypostatic pneumonia, amyloid degeneration of viscera.				1	1
15	Joseph F.	5	14	?	Very poor.		35 0						1	Pustules on scalp.			Unimproved.		
16	Dom. F.	7	70	3	Anemic; emaciated; walks with great difficulty.	Discharging abscess above hip.	30 0	34 4			Right.						Unimproved; emaciated; increased discharge.		
17	Phillip F.	3½	1517	2	Very poor; anemic.	Sinus under l. shoulder.	29 9				Left.	Shoulder.		Diphtheria.	Mother died.	Excellent; plaster jacket.			
18	Maggie B.	7	777	2	Poorly nourished; anemic.	Wears brace and head spring.	33 9	42 14							Father died.		Cured; wears no brace or support.		
19	Amelia B.	2½	133	?	Fairly well nourished.	Enlarged nodules in cervical region; discharge of ear.	19 8	24 2					1		Father.		Improved.		
20	Joseph A.	1½	130	½	Anemic; does not walk	Abdomen much enlarged.	20 8	24 1					1				Well nourished; walks well; abdomen slightly enlarged.		
21	Petro A.	7	500	1	Well nourished.	Three sinuses; old open wound of operation.	42 8	51 5					1				Cured.		
22	Salvator B.	7	133	1	Anemic; walks lame.	Sinuses on leg inflamed areas surrounding.	42 0	45 8				Elbow.			Probable.		Improved—scarcely any discharge.		
23	Bennie M.	9	132	2	Pale; ill nourished.	Sinus running down to joint; l. elbow ankylosed.	38 8	45 8				Knee.					Cured.		
24	Mariano A	11	453	6	Very poor.	Two sinuses.	65 0	85 0				Ankle.					Cured.		

TABLE II.—SEA BREEZE HOSPITAL. RECORD OF CASES FROM THE OPENING, JUNE, 1904, TO JULY 31, 1908.—(*Continued.*)

No.	Name.	Age, Years.	Hosp. Days.	Ill Before Admission, Years.	Condition when Admitted.		Weight.		Lesion.				Complications. Other Illness.	Tuberculosis in Family.	Condition of Patient.		Died.	
					General.	Local,	Admiss.	Disch.	Spine.	Hip.	Joint.	Gland.			In Hosp. July 31, 1908.	At Time of Discharge.	In Hosp.	Later.
							lb. oz.	lb. oz.										
25	Mary A.	13	66	1½	Anemic; thin; walks badly; miserable.	Necrotic bone in elbow; wound on thigh.	71 12	65 8			Elbow.		Pulmonary tub.; diphtheria.			Unimproved; unable to walk; 4 sinuses.		1
26	Philomena C.	4	1509	1	Anemic.	Wound on back over rib, 2 in orbit, all discharging.	41 6				Orbit jaw, rib.	1	Congenital syphilis.		Excellent.			
27	Angelina C.	4	123	1	Fairly well nourished.	Scar with induration on r. thigh.	32 0	35					Congenital syphilis.			Cured.		
28	Esther S.	9	112	2	Well nourished; good color.	Lymph-nodes on l. side of neck.	53 8	59 4				1				Cured.		
29	Morris L.	5	1083	4	Anemic; scarcely walks.	Three discharging sinuses on l. leg above knee.	31 4	43		Left.	Knee.					Cured; diagnosis acute osteomylitis of l. femur.		
30	Marie L.	7 11	123	⅓	Well nourished.	Index finger of l. hand amputated.	55 8	57 4			Finger.	1				Cured.		
31	Bertha M.		1302	5	Slightly anemic; wears hip splint.	Lymph-nodes in cervical region.	68 4	100 2		Left.						Cured.		
32	Lucy E.	8	790	1	Good.	Wound in l. side of jaw, discharging freely.	43 12	62 2			Jaw.					Cured.		
33	Joseph W.	5	549	4	Very miserable; walks feebly.	Two discharging sinuses.	27 0	26	1		Elbow, jaw.					Unimproved		1
34	Bessy B.	6	126	2	Anemic.	On Bradford frame.	35 8	36 8	1		Jaw.					Unimproved.		
35	Florence V.	8	439	2	Anemic; walks with stoop.	Two discharging sinuses.	45 0	52			Knee, leg, arm.		Cong. syphilis.			Improved.		
36	Luca E.	8	96	1/12	Fair; good color.	Small nodules in neck	32 12	35 4				1		Sister.		Improved.		1
37	Katy F.	5	1345	1	Anemic.	Wears plaster jacket.	34 2	55 2	1					Father.		Cured.		
38	Regina G.	4	103	⅔	Anemic.	Wound unhealed over 6th rib on l. side.	32 8	36 4				1		Grandfather.		Cured.		
39	Charles O'C.	8	833	1	Fair; mucous membrane pale.	Abscess on rt. thigh with sinus.	35 0	39 6		Right.			Amyloid degeneration of viscera.	Father.		Unimproved.		1
40	Jack J.	9	66	?	Very poor.	Wears Foster jacket.	29 8	31 8	1							Improved; taken out against advice.		

TABLE II.—SEA BREEZE HOSPITAL. RECORD OF CASES FORM THE OPENING, JUNE, 1904, TO JULY 31, 1908.—(*Continued.*)

No.	Name.	Age, Years	Hosp. Days.	Ill Before Admission, Years.	Condition when Admitted.		Weight.			Lesion.				Complications. Other Illness.	Tuberculosis in Family.	Condition of Patient.		Died.	
					General.	Local.	Admiss.	Disch.		Spine.	Hip.	Joint.	Gland.			In Hosp. July 31, 1908.	At Time of Discharge.	In Hosp.	Later.
							lb. oz.	lb. oz.											
41	Madeline G.	4	1480	3	Fairly well nourished; good color.	No pain or tenderness over l. shoulder.	25 14			1					Father died.				
42	Katie B.	7½	1017	½	Good.	Knee swollen; no motion; atrophy of thigh and calf; wears brace.	43 14	58 10				L. knee.					Cured.		
43	Amiel B.	10	23	1	Anemic.	Chains of nodes on both sides of neck.	67 0	69 4					1				Improved; left without permission.		
44	Margaret S.	5	160	1	Pale; emaciated; walks badly.	Abdomen large tense, tender; enlarged lymph-nodes in groin.	27 12	28 8					1	Peritonitis; pulmonary tuberculosis.			Unimproved; lungs affected.		1
45	Frank T.	3	410	1	Fairly well nourished; anemic.	Finger swollen; two sinuses; l. eye very red.	21 11	31 4				Rib, finger.					Cured.		
46	Susie M.	7	80	½	Fairly well nourished.	Lump on back, tender to touch.	34 0	35 8		1					Father, probably mother.		Much improved		
47	Joseph M.	7	53	7	Well nourished.	Left hand hangs helpless.	46 0	53				L hand.					Improved.		
48	Katie W.	6	1000	½	Good; limps.	No sign of abscess.	38 0	48 8				L. knee.					Cured.		
49	Margaret B.	8	78	1	Good color; well nourished.	Lymph-nodes on one side of neck	57 0	61 12					1				Improved.		
50	Maggie S.	7	78	5	Anemic.	Foci, soft, red, under chin and in right and l. cervical region.	44 0	50					1				Cured.		
51	Ellen F.	4	515	1	Seems well nourished, but anemic.	Areas of redness and induration in the cervical region.	27 15	38 8					1		Mother died.		Cured.		
52	James C.	4	90	2	Fairly well nourished; bad front teeth.	Tender over rt. hip; thigh stiff; hip splint.	35 12	34 12			Right						Taken out against advice.		1
53	Tom S.	5	130	½	Good.	Small nodes all over sternomastoid muscle.	44 0	47 8					1		Sister, father.		Cured.		

TABLE II.—SEA BREEZE HOSPITAL. RECORD OF CASES FROM THE OPENING, JUNE, 1904, TO JULY 31, 1908.—(*Continued.*)

No.	Name.	Age, Years.	Hosp. Days.	Ill Before Admission, Years.	Condition when Admitted.		Weight		Lesion.				Complications. Other Illness.	Tuberculosis in Family.	Condition of Patient.		Died.	
					General.	Local.	Admiss.	Disch.	Spine.	Hip.	Joint.	Gland.			In Hosp. July 31, 1908.	At Time of Discharge.	In Hosp.	Later.
							lb. oz.	lb. oz.										
54	Nathan N.	5	1043	2	Poor; operation wound still discharging.	Hip joint sensitive; discharge from two sinuses.	28 8	33 10		Left.				Father.		Cured.		
55	Freddie S.	3½	548	½	Anemic.	Spasm of muscles about hip.	32 2	39		Left.				Mother.		Cured.		
56	Margaret P.	6¾	52	3	Not well nourished; anemic.	Has high shoe on r. foot.	37 8	40 8		Right						Cured.		
57	Robert M.	6	1226	4	Fairly well nourished; wears hip splint.	Healed scar on hip below a discharging sinus 4 cm. long.	35 12	49 12		Right						Cured.		
58	Willie H.	9	130	2	Fairly well nourished; good color.	R. arm stiff; shoulder diseased; discharging sinus.	59 4	63 8			Shoulder.					Cured; no motion at joints, ¼-inch atrophy of arm.		
59	Millie C.	3½	52	1	Anemic; emaciated; miserable.	Elbow much diseased; discharging freely.	23 8	26 8			Elbow.			Father, probably		Unimproved.		1
60	Philomena M.	8	62	½	Fairly well nourished; good color.	Enlarged node on r. side of neck.	39 0	41 8				1				Improved.		
61	Margaret D.	4	865	1½	Anemic; cannot walk; left foot bandaged.	Five discharging sinuses about ankle	26 0	41 5			L. ankle.					Cured.		
62	John A.	8	60	1	Fair; does not see well.	Discharging sinus in right arm.	57 0	61			Rt. arm.			Father.		Unimproved.		1
63	Marie B.	10	1383	1½	Fair.	Two large freely discharging sinuses on either side of neck.	59 4		1			1			Cured			
64	Emil H.	13	330	5	Poor; emaciated; cachectic; anemic.	Six sinuses in region of right hip; spleen palpable.	58 10	55 6		Right			Amyloid degeneration of viscera.			Unimproved; dischg.on acct. pulmonary involvement.		1
65	Mary McG.	9	1288	6	Very poor; pale, thin; wearing Thomas brace.	Knee much swollen and profuse, offensive discharge.	38 6				Rt. knee.			Grandfather.	Good; Thomas knee brace.			

TABLE II.—SEA BREEZE HOSPITAL. RECORD OF CASES FROM THE OPENING, JUNE, 1904, TO JULY 31, 1908.—(*Continued.*)

No.	Name.	Age, Years.	Hosp. Days.	Ill Before Admission, Years.	Condition when Admitted.		Weight.				Lesion.				Complications. Other Illness.	Tuberculosis in Family.	Condition of Patient.		Died.	
					General.	Local.	Admiss.		Disch.		Spine.	Hip.	Joint.	Gland.			In Hosp. July 31, 1908.	At Time of Discharge.	In Hosp.	Later.
							lb.	oz.	lb.	oz.										
66	Albert G.	4	1179	½	Poor; paraplegia; gait unsteady.		36	0	45	0	1							Cured.		
67	Mary McC.	8	1067	3	Very poor; anemic; wears Thomas brace.	Two discharging sinuses.	42	8	59	0			L. knee.					Cured.		
68	James B.	9	278	⅛	Moderate anemia; wears Thomas brace; walking painful.	One-inch atrophy of calf; motions limited; foot swollen.	31	0	24	0			Rt. ankle.					Cured.		
69	Jessie C.	4	1048	1	Good; does not walk; child evidently in pain most of the time.	Wears P. of P. spica.	37	2	44	0		Right.				Uncle.		Cured.		
70	Elsa K.	10	379	2	Poor; limps.	Five sinuses discharging freely.	52	12	54	4		Left						Improved; removed against advice.		
71	Mary J.	6	1253	1	Good; wears Thomas brace	Limited motion of knee in all directions.	34	8			1		L. knee.				Excellent; p.p. jacket; knee bandage.			
72	Max G.	5	554	3	Very poor; emaciated; unable to walk.	One sinus, spine extensively involved; large abscess l. iliac.	26	4	25	8	1							Incurable; tub. spine, lungs and probably intestines.		1
73	Nathan S.	6	808	1	Poor; hops on l. foot; motion limited right ankle.	One sinus behind interior malleolus.	32	8	46	0			Rt. ankle, 2 fingers.					No sign of active disease; brace left off; cured.		
74	Minnie M.	10	534	4	Very anemic.	One discharging sinus.	19	4	17	10	1				Otitis media.			Unimproved.	1	
75	John G.	5	1180	½	Good.	Wears jacket.	33	3	46	0	1					Father died.		Cured.		
76	John W.	8	103	4	Emaciated; cachectic.	Sinus; lungs weak; liver and spleen enlarged; moribund.	29	5	32	3		Right.							1	

TABLE II.—SEA BREEZE HOSPITAL. RECORD OF CASES FROM THE OPENING, JUNE, 1904, TO JULY 31, 1908.—(*Continued.*)

No.	Name.	Age, Years.	Hosp. Days.	Ill Before Admission, Years.	Condition when Admitted.		Weight.		Lesion.				Complications. Other Illness.	Tuberculosis in Family.	Condition of Patient.		Died.	
					General.	Local.	Admiss.	Disch.	Spine.	Hip.	Joint.	Gland.			In Hosp. July 31, 1908.	At Time of Discharge.	In Hosp.	Later.
							lb. oz.	lb. oz.										
77	Annie M.	6½	345	2	Emaciated; unable to walk.	Hip badly diseased, discharging from 9 sinuses.	26 8	26 8		Right.			Amyloid degeneration of viscera.			Worse, on account of pulmonary involvement.		1
78	Florence M.	2	501	½	Very poor.		44 8	38 5	1				Otitis media.			Unimproved.		
79	James B.	7	82	2	Emaciated; does not walk.	Hip sensitive; ulcer on r. heel: swelling in l. groin; 3 sinuses.	31 4	24 0		Left.			Septicemia, amyloid degeneration of viscera.	Father and mother died.			1	
80	Joe M.	4	1290	⅛	Fair; stoops.	Pain on manipulation.	34 3		1						Fine; plaster of P. jacket.			
81	Pasquale F.	13	412	5	Poor condition; unable to walk.	Three hip sinuses; joint sensitive; range of motion 5 per cent.	56 14	56 1		Left.			Amyloid degeneration.			No improvement.		1
82	Fanny B.	6	910	1	Very poor; limps.	Both chains of cerv. glands palpable; ear discharge.	23 3	35 0	1							Cured.		
83	Leo E.	6	1018	3	Poor; anemic; unable to walk.	One abscess; three sinuses.	35 12			Left.					Good.			
84	Louis H.	5	1016	1	Good.	Limited motion in hip; tender.	31 0			Right.				Father.	Good; hip brace with extension.			
85	Fred Q.	14	256	½	Wears plaster of Paris on l. knee.	Knee in extension.	70 4	87 2			L. knee.			Tubercul's family.		Cured; walks well, no limp.		
86	Florence S.	8	62	1	Poor.	Superficial glands; submaxillary and cervical chains palpable.	46 14	47 12				1		Father died.		Much improved.		
87	Willie S.	4	231	½	Poor.	Cervical glands enlarged; discharging sinuses; scars.	35 5	36 7				1				Cured.		
88	John C.	9	92	6	Very poor; unable to walk.	Both hips in flexion; ankylosed; many sinuses from left hip.	52 12	41 12		Double	Rt. ankle.		Nephritis.			Unimproved Prognosis: "Surely fatal."		1

TABLE II.—SEA BREEZE HOSPITAL. RECORD OF CASES FROM THE OPENING, JUNE, 1904, TO JULY 31, 1908.—(*Continued.*)

No.	Name.	Age, Years.	Hosp. Days.	Ill Before Admission, Years.	Condition when Admitted.		Weight.		Lesion.				Complications. Other Illness.	Tuberculosis in Family.	Condition of Patient.		Died.	
					General.	Local.	Admiss.	Disch.	Spine.	Hip.	Joint.	Gland.			In Hosp. July 31, 1908.	At Time of Discharge.	In Hosp.	Later.
							lb. oz.	lb. oz.										
89	Florence W.	10	915	6	Poor.	Evidence of paraplegia.	39 0		1						Good; plaster jacket.			
90	Kenneth T.	3½	931	½	Fair.	Limited motions in all directions in lower dorsal region.	27 8		1						Excellent; plaster jacket.			
91	Camille M.	2	932	1	Well nourished; child never walked.	Upper dorsal region held stiffly.	23 6		1						Very good; plaster jacket.			
92	Theodore T.	8	702	4	Anemic.	One sinus, not much discharge.	40 2	45 8		Left.				Father.		Cured.		
93	Grace M.	7	101	1	Fair.	Various glands in neck and axilla enlarged; opacity in cornea.	54 6	58 14				1		Mother died.		Improved.		
94	Judith M.	2½	95	¼	Very anemic; unable to stand.	Back held stiff and limited motions in all directions.	23 8	20 6	1							Sent to Presb. Hosp. Diagnosis: Multiple sarcoma.		1
95	Tudor R.	3	855	⅓	Well nourished.	Motions limited in all directions; joint sensitive and painful.	32 8			Left.				Father died.	Good; extension; in bed.			
96	Mary B.	3	841	⅓	Fair; walks with marked limp on diseased side.	Muscular spasm and motions limited; joint very sensitive.	34 12			Right.					Fine; plaster spica.			
97	Daniel R.	8¼	340	2	Poor.	Thickening of phalanx; 2 sinuses.	43 0	47 7			Finger.					Cured. Diagnosis: Congenital syphilis.		
98	Joe R.	7	339	¼	Good.	Slight thickening of metacarpal bone.	49 0	54 2			L. wrist.					Cured. Diagnosis: Syphilitic ostitis of left carpus.		
99	Frank P.	4½	497	1	Poor.	Freely discharging sinus.	29 0	36 0			L. elbow.					Cured.		
100	August R.	3	721	1	Well nourished.	Large abscess in l. thigh; motions limited and painful.	25 13			Left.				Mother died.	Excellent; plaster spica.			

TABLE II.—SEA BREEZE HOSPITAL. RECORD OF CASES FROM THE OPENING, JUNE, 1904, TO JULY 31, 1908.—(*Continued.*)

No.	Name.	Age, Years.	Hosp. Days.	Ill Before Admission, Years.	Condition when Admitted.		Weight.		Lesion.				Complications. Other Illness.	Tuberculosis in Family.	Condition of Patient.		Died.	
					General.	Local.	Admiss.	Disch.	Spine.	Hip.	Joint.	Glaud.			In Hosp. July 31, 1908.	At Time of Discharge.	In Hosp.	Later.
							lb. oz.	lb. oz.										
101	Stanley H.	5	60	1	Well nourished; healthy looking.	Neck scars of old ulceration; glands palpable in post. cerv. region.	35 2	38 2				1		Father.		Much improved.		
102	Agnes C.	6	482	2	Emaciated; poorly nourished.	Rigid spine; large rt. psoas abscess; legs atrophied.	38 10		1						Excellent; Bradford frame.			
103	Louis G.	?	269	2	Very poor.	Left knee held at rt. angles; ankylosis; several sinuses.	41 8	45 0			L. knee.					Cured.		
104	David G.	14	86	1	Very poor; anemic.	One large discharging sinus.	78 7	86 8	1							Improved.		
105	Bessie R.	2½	457	1½	Good.	Sinus over l. shin; rt. knee swollen.					Knee.		Syphilis.		Fine; plaster bandage.			
106	Jack S.	5	453	2	Good.	P. p. on rt. thigh; limitation of motion; swelling.	35 8								Fine; polyclinic hip brace.			
107	Robert H.	9	424	1	Emaciated; anemic.	Sinuses in each groin; 2 sinuses in back of neck.	35 3		1	Right.						Unimproved.		
108	William H.	3	414	1	Poor condition.	One sinus.	27 0		1			1			Improved.			
109	Frank K.	13	220	1	Anemic; thin.	Two discharging sinuses; l. hand swollen.	57 0	70 0			L. carpus.			Father; pul. tub.		Cured.		
110	James McG.	11	64	½	Pale; thin; limps on crutches.	Abscess in lumbar region.	60 2	69 0	1							Much improved.		
111	Rose S.	9	406	2	Poor; wears long hip splint.	Abscess in lower rt. iliac region; sinus.	42 12			Right.			Syphilis.		Fair; hip brace.			1
112	Sol. S.	12	240	1	Fairly well nourished.	Two large sinuses.	62 4	60 4		Right.								
113	Jacob B.	3	374	1½	Pale; very poor.	Three discharging sinuses.	24 8		1						Excellent; Bradford frame.			
114	James S.	9	374	7	Fairly well nourished.	Plaster of Paris splint.	41 12			Left.						Cured.		

TABLE II.—SEA BREEZE HOSPITAL. RECORD OF CASES FROM THE OPENING, JUNE, 1904, TO JULY 31, 1908.—(*Continued.*)

No.	Name.	Age, Years.	Hosp. Days.	Ill Before Admission, Years.	Condition when Admitted.		Weight.			Lesion.				Complications. Other Illness.	Tuberculosis in Family.	Condition of Patient.		Died.	
					General.	Local.	Admiss.	Disch.		Spine.	Hip.	Joint.	Gland.			In Hosp. July 31, 1908.	At Time of Discharge.	In Hosp.	Later.
							lb. oz.	lb. oz.											
115	Susie B.	2	354	1	Poor.	On Bradford frame.	22 0			1						Excellent; plaster jacket.			
116	Robert A.	3	354	½	Fair.		18 8			1						Fair; plaster jacket.			
117	Frank E.	7	267	3½	Good; wears Thomas hip splint.	Four discharging sinuses, 1 in groin.	45 4				Left.					Good; hip brace.			
118	Abbie L.	9	53	2	Very poor.	Wears plaster of Paris jacket.	41 0	42 14		1							Improved.		
119	Ruth H.	2	33	1	Color poor; nutrition good.		27 0	27 12					1				Improved.		
120	George H	11	225	1	Fair.	Discharging sinuses.	49 8				Left.					Fine.			
121	Simon H.	6	193	2	Fair.	Two sinuses at elbow; l. wrist; 2 sinuses on hand.	29 11					Elbow.				Good.			
122	David D.	2	192	½	Good.	Marked curvature of spine.	23 0			1						Excellent; Bradford frame.			
123	Elizabeth O.	7	183	5	Good.	Right knee in slight flexion; marked limit. of motion.	41 0					Knee.				Excellent; plaster bandage.			
124	Tony T.	4	185	1	Very poor.	Discharging sinus.	25 9			1		Shoulder.				Fair: Bradford frame.			
125	Raymond R.	5½	165	1½	Good; wears short spica.	Wears plaster of Paris spica.	29 4				Left.					Excellent; extension; in bed.			
126	Mary H.	5	155	¼	Fair; adenoids; indurated mass under jaw; sinus.	Discharging sinus.	32 0						1			Excellent.			
127	Harry S.	3	120	½	Good.	Moderate kyphosis; motions of spine limited in all directions.	29 0			1						Good; Bradford frame.			

TABLE II.—SEA BREEZE HOSPITAL. RECORD OF CASES FROM THE OPENING, JUNE, 1904, TO JULY 31, 1908.—(*Continued.*)

No.	Name.	Age, Years.	Hosp. Days.	Ill. Before Admission, Years.	Condition when Admitted.		Weight.		Lesion.				Complications. Other Illness.	Tuberculosis in Family.	Condition of Patient.		Died.	
					General.	Local.	Admiss.	Disch.	Spine.	Hip.	Joint.	Gland.			In Hosp. July 31, 1908.	At Time of Discharge.	In Hosp.	Later.
							lb. oz	lb. oz.										
128	Joseph D.	9	18	1½	Poor.	Discharging wound on abdomen.	61 4	59 0				1	Pulmonary tuberculosis.			Unimproved. Diagnosis: Probably pulmonary tub.		
129	Anna J.	8	96	2			44 6		1						Excellent; plaster jacket.			
130	Moritz N.	8	94	1	Fair.	Right elbow swollen; several discharging sinuses.	48 7				Elbow Wrist.		Congenital syphilis.		Cured.			
131	Margaret O.	4	64	⅔	Good.	Kyphosis at lumbo-thoracic region; child evidently in great pain.	29 0		1						Fine; Bradford frame.			
132	Agnes H.	3	31	1	Well nourished.	Glands under jaw, enlarged, palpable.	26 8								Good.			
133	Nellie M.	5	24	1	Poor nutrition.	Plaster of Paris spica.	32 8			Left.					Good; plaster spica.			
134	Willie C.	4	393	1	Fair.	Abscess; rt. thigh in extension; back stiff; limitation of motion at knee.	24 6		1	Right.					Fair; Bradford frame with extension.	Improved.		
135	William H.	16	112	6	Poor.		57 0	67 0	1									
136	Henry R.	5	78	2	Delicate.	Glands palpable in neck.	35 8	38 8				1				Good.		

Le Traitement à l'Air de la Mer et à l'Air pur, employé à l'Hôpital "Sea Breeze," pour les Cas de Tuberculose des Os, des Articulations et des Glandes chez les Enfants.—(BRANNAN.)

L'hôpital "Sea Breeze," le premier établissement expérimental américain pour le traitement par l'air de la mer de la tuberculose des os et des glandes, fut établi il y a quatre ans sur la plage de Coney Island, par la New York Association for Improving the Condition of the Poor. Les enfants pendant le premier été furent logés dans des tentes, mais depuis, dans un bâtiment muni de nombreuses fenêtres et de larges balcons ouverts. On y reçoit toutes les variétés de tuberculose des os, des articulations et des glandes. On n'a pas essayé de choisir les cas. Quatre cinquièmes des cas sont avancés. Des premiers 43 malades, 27 avait un ou plusieurs sinus avec écoulement de pus, 71 cas en tout. Les cas qui se présentèrent ensuite avaient le même degré de gravité. Les enfants passent 24 heurs en plein air, le jour sur la plage ou sur des vérandes ouvertes, la nuit dans des salles dont les fenêtres sont ouvertes de tous les côtés à toute saison de l'année. La nourriture est riche et abondante, cinq repas par jour, bien cuits et bien servis. Une amélioration sensible apparait de suite chez les malades, d'abord dans la condition générale, plus tard dans les lésions locales. L'amélioration générale se manifeste dans l'apparence, la vivacité, l'appétit, profond sommeil et gain de poids. Les sinus se ferment rapidement et d'une manière permanente, surtous s'ils sont exposés directement à l'eau de mer; très-peu d'opérations nécessaires, mais l'opération est suivie d'un progrés rapide, caractéristique du traitement en plein air.

Pendant les quatre ans 136 malades ont été en traitement; 68 de ces malades, la moitié exactement, étaient des cas de maladies de l'épine dorsale ou de la hanche, et dans 81 pour cent ces dernières affections étaient dans un état avancé au moment de l'admission à l'hôpital. Quarante-deux des 68 cas ont été congédiés, et 36 pour cent de ces cas congédiés étaient guéris et 19 pour cent améliorés, ce qui fait un total de 55 pour cent qui étaient ou guéris ou sur le chemin de la guérison quand ils quittèrent l'hôpital. Parmi les cas congédiés, il y en avait 22 chez lesquels le genou ou une autre articulation était affectée. Quoique 80 pour cent fussent dans un état avancé, 73 pour cent furent guéris et 13 pour cent améliorés.

L'avenir de l'hôpital Sea Breeze. Le but premier est atteint. Il est démontré que pour obtenir les meilleurs résultats dans la tuberculose des os et des glandes, le malade doit passer tout son temps en plein air, et que le bord de la mer offre des avantages spéciaux pour la vie en plein air pour les enfants. On a reçu des souscriptions d'on total de $250,000 pour un hôpital permanent. La ville de New York a promis un emplacement pour l'hôpital et s'engage à le maintenir quand il sera fini.

Die Behandlung am Meeresufer und in der freien Luft in dem Sea Breeze Hospital für tuberkulöse Krankheiten der Knochen, Gelenke und Drüsen.—(BRANNAN.)

Das Sea Breeze Hospital, die erste amerikanische Versuchsstation für die Seeluftbehandlung für Knochen- und Drüsentuberkulose, wurde vor vier Jahren am Strande von Coney Island von der New York Gesellschaft für die Verbesserung der Zustände unter den Armen (New York Association for Improving the Condition of the Poor) errichtet. Während des ersten Sommers wurden die Kinder in Zelten untergebracht, seit damals jedoch in Gebäuden, die mit zahlreichen Fenstern und weiten, offenen Balkonen versehen sind. Alle Arten von Knochen-, Gelenk- und Drüsentuberkulose werden zugelassen. Kein Versuch einer Auswahl wird gemacht. Vier Fünftel sind vorgeschrittene Fälle. Von den ersten 43 Patienten hatten 27 ein oder mehrere eiterige Fistelgänge, im Ganzen 71 Fistelgänge. Derselbe Grad von schweren Fällen herrscht auch in den späteren Patienten vor. Die Kinder bleiben die ganzen 24 Stunden in der freien Luft, am Tage am Ufer oder auf den offenen Gallerien, des Nachts in Schlafsälen, deren Fenster das ganze Jahr hindurch weit offen sind. Die Diät ist nahrhaft und im Überfluss vorhanden, fünf Mahlzeiten täglich, gut gekocht und serviert. Deutliche Besserung ist sofort in den Patienten ersichtlich, zuerst im Allgemeinzustande, später in den lokalen Affektionen. Allgemeine Besserung zeigt sich im Aussehen, der Stimmung, im Appetit, gesunden Schlafe und fortdauernder Schliessung der Fisteln, besonders wenn unmittelbar dem Seewasser ausgesetzt. Operationen sind selten notwendig, wenn aber ausgeführt, sind sie von raschem Fortschritt begleitet, was der Freiluftbehandlung charakteristisch ist.

Während der 4 Jahre waren 136 Patienten in Behandlung, von denen 68, genau die Hälfte, Fälle von Rückgrat- und Hüft-Krankheiten waren. Von diesen waren 81% in einem vorgeschrittenen Stadium zur Zeit ihrer Zulassung. Zweiundvierzig von den 68 Fällen sind entlassen, und von diesen sind 36% geheilt und 19% gebessert, im Ganzen 55%, die entweder gesund waren oder ihrer Heilung entgegenschritten, als sie das Spital verliessen. Unter den Entlassenen waren 22, in denen entweder das Knie oder ein anderes Gelenk ergriffen war. Obschon 80% in einem vorgeschrittenen Stadium waren, wurden doch 73% geheilt und 13% gebessert.

Der ursprüngliche Zweck erfüllt. Es ist bewiesen, dass, um die besten Erfolge zu erlangen, der Patient die ganze Zeit in der freien Luft zubringen muss, und dass das Meeresufer besondere Vorteile für das Leben in der freien Luft für Kinder darbietet. Subscriptionen im Betrag von $250,000 für ein permanentes Spital erhalten. Die Stadt New York hat einen Platz für das Hospital und seine Aufrechterhaltung versprochen, sobald es vollendet ist.

THE POSSIBILITY OF AVOIDING CONSPICUOUS SCAR FORMATION IN SOFTENED TUBERCULOSIS OF THE CERVICAL GLANDS.

By Willy Meyer, M.D.,
Professor of Surgery at the New York Postgraduate Medical School and Hospital, New York.

Every surgeon, when confronted with the necessity of operating for broken-down tubercular glands of the neck, has pondered how best to proceed in order to cause the least possible scar formation. In boys and men the matter is not important, and we rarely hesitate to advise radical operation, especially if saving time is a consideration. It is different, however, with the opposite sex. Here the surgeon will welcome any means that may tend to improve the cosmetic result.

If we make the skin incision—even if it be inches in length—within the normal folds of the neck, transversely, the result is far superior to that obtained from incisions made parallel with the borders of the sternocleidomastoid muscle. Still, there will be a more or less conspicuous permanent mark. Hence, a method that reduces such scar formation to a minimum, requiring incisions only one-fifth to one-tenth as long as before, should be greeted with enthusiasm. The greater time and trouble such a procedure may, in these cases, call forth from the surgeon and his attentions, should not deter, when the result is taken into consideration. The treatment alluded to is Bier's artificial hyperemia. The personal material I am able to offer in this connection is rather small. The hospital with which I am principally associated does not possess a large children's ward. The few beds are designed for emergency cases rather than chronic cases. The patients are dispensary cases, rather than hospital cases, or patients that should be treated in the surgical division of country sanatoriums. Three of my patients have been observed in dispensary and office practice. After some improvement at the end of a few weeks, I lost sight of them, so that I cannot report final results. In all five patients I have observed the same satisfactory course as has been reported by others.

I made these patients wear the elastic neck-band ten hours out of every twelve. The band, made of the same material as the black elastic rubber bandage, with a button in one end and a number of buttonholes in the other, is a very comfortable appliance. The one made of the ordinary garter

elastic, with a hook and several eyes, comes next. The compression of the deep jugular veins should not be sufficient to cause the patient annoyance: he must be able to talk, eat, drink, breathe, and sleep without discomfort. In fact, he must hardly be aware of the presence of the band. It is astonishing how quickly children, even babies, get used to the band.

The appearance of fluctuation at the site of the trouble is carefully watched for. It may be hastened by the continuous application of a warm wet gauze (Priessnitz) dressing. As soon as it appears, a short cut is made, in the course of the neck fold, and the pus is evacuated. If the muscles or subcutaneous fat tend to overlap the incision, a drain of small size is introduced for twenty-four to thirty hours. Otherwise, the wound is simply left open and suction treatment started four to five hours later.

It is advisable to use the cup once daily for a period of forty-five minutes (*i. e.*, five or six minutes of suction with two or three minutes' intermission each time) soon after the bandage has been removed. Packing or injections of iodoform emulsion or bismuth paste are never used. It will be observed that glandular débris is aspirated with the pus. It is natural to place both the fistulous tract and the entire diseased area under suction, thus combining the hyperemic effect on the deeper tuberculous tissue with regular gentle evacuation of the abscess. If the treatment is properly carried out, a mixed infection will not occur. Soon the purulent secretion becomes serous. In favorable cases the opening closes rapidly. The remaining slight infiltration gradually becomes absorbed under the continued use of the elastic neck-band.

It stands to reason that a patient in whom a sinus has already developed, when first seen can be equally successfully treated by this method, but the elastic band should always assist the suction treatment.

Bier himself seems to be satisfied with suction treatment alone. From what I have seen, however, I believe it worth while to use the remaining twenty to twenty-two hours, trying to influence the tuberculous tissue by hyperemia produced with the neck-band. Klapp, among others, has reported a most striking case of this kind.*

With the permission of a colleague I relate the following case:

Boy, five years of age, the only surviving child of a number of children, developed a package of tuberculous glands in front of the sternocleido muscle, right behind the angle of the jaw, following some throat trouble. His parents, on account of the delicate condition of the boy, live in the country all the year around. They are as greatly averse to placing the child in a hospital as they are to radical extirpation, since they have only recently lost another child soon after an operation. The glands are softened; deep fluctuation can be made out. The family physician is familiar with hyper-

* A. Bier, on Hyperemia, p. 219, P. 4.

emic treatment, favors its use in this case, and asks my advice. The case seemed especially adapted for this procedure. Consequently an elastic neck-band and a set of properly fitting cups were procured and a trained nurse was engaged. The band did not give the slightest annoyance. The boy seemed perfectly at ease, riding his bicycle and playing around to his heart's content. Under ethyl chlorid spray and local cocain anesthesia the abscess was opened by a short transverse incision in the course of the neck fold, and suction treatment started. In this way, with the little patient in his former surroundings, all day long in the fresh air, with milk feeding from their own cow, the trouble took a more favorable course. The wound closed definitely four weeks after incision. All the glandular enlargement gradually disappeared.

To-day, four months later, a minute scar, about three-quarters of an inch long, well hidden in the natural fold of the neck, is the only remaining sign of the previous existence of a tuberculous gland.

Of course, the method will not succeed in every case; artificial hyperemia is no panacea. In the more serious cases, *e. g.*, multiple softened glandular tuberculosis of the neck, general antituberculous treatment with tuberculin injections may be advantageously added.

The lung suction mask, too, may well be put into service in these cases. For it has been proved that it not only produces hyperemia of the lung tissue by suction, but constitutes one of our best means of improving the condition of the blood in all its components. It deserves a much wider use than it has been hitherto accorded. If the present device does not fully answer all the requirements, something better will be constructed. The principle, certainly, is correct, and should be used in our fight against pulmonary as well as other tuberculous diseases. It is unfortunate that Kuhn's mask is protected by patents which render it costly of importation and difficult of repair.

In conclusion I would say that my personal results from the combined use of the elastic neck-band and the suction cups have been brilliant and rapid also, in cases of broken-down cervical adenitis following tonsillitis (*e. g.*, of scarlet fever), or following suppurative periostitis of the jaw and other causes.

But no matter what the etiology, I am convinced that the treatment above outlined merits the full and most careful attention of every physician and surgeon, and is of particular value in female patients. The well-known chains of hard tumors, in smaller or larger packages, belonging to the type of glandular tuberculosis of the neck, are distinctly operative cases.

Index to Volume II, Section III.

PAGE

Abdominal Tuberculosis, Acute Forms of.—Dr. D. N. Eisendrath 303
*Air frais combiné avec le traitement par l'hyperémie dans les cas chirurgicaux de tuberculose compliquée des os chez les adultes,—Du traitement par l'.—Dr. W. Meyer..... 217
*Aire Puro Combinado con el Tratamiento Hiperémico en los Casos Quirúrgicos de Tuberculosis de los Huesos en el Adulto.—Dr. W. Meyer..... 217
*Augenhöhle, Werth der Ophthalmo-Tuberculin-Probe in der chirurgischen Behandlung.—Dr. C. A. Oliver 28

Beck, Dr. Carl.—The Value of the Roentgen Method in the Early Recognition of Tuberculosis of Bones and Joints..... 144
Beck, Dr. E. G.—The Surgical Treatment of Tuberculous Sinuses and their Prevention..... 219
Discussions.....59, 77, 124, 256, 310
Bellamy, Dr. Russell..... 124
Berlin, Dr. H..... 77
Bevan, Dr. A. D.—Tuberculosis of the Kidney..... 176
Discussion..... 310
*Bladder, Tuberculosis of the.—Dr. W. Karo..... 162
Bladder, Tuberculosis of the.—Dr. B. Lewis..... 165
Blake, Dr. C. J.—Tubercular Disease of the Middle Ear 35
Blasentuberkulose.—Dr. W. Karo... 157
Bones and Joints, How the State of Minnesota cares for its Indigent Children suffering from Tuberculosis of the.—Dr. A. J. Gillette..... 251
Bones and Joints, Tuberculosis of the.—Dr. E. H. Bradford..... 204
*Bony and Articular Cavities with Mosetig Paste, Obliteration of Tuberculous.—Prof. Nové-Josserand. 142
Bradford, Dr. E. H.—Tuberculosis of Bones and Joints..... 204
Discussion..... 256
Breast, Tuberculosis of the.—Dr. W. L. Rodman..... 346
Cabot, Dr. A. T..... 124

PAGE

*Cadera, Arthritis Tuberculosa de la.—Dr. S. H. Weeks..... 100
Calot, Prof. F.—Treatment of Hip-joint Disease..... 148
Caravia, Dr. E.....122, 256
Casselberry, Dr. W. E.—Tuberculosis of the Larynx 12
*Cervical-Lymphdrüsen, Tuberkulose der. Bericht über 275 Fälle von Radical-Extirpation.—Dr. C. N. Dowd 58
Cervical Lymph-nodes, Tuberculosis of the. Report of 275 Cases treated by Radical Extirpation.—Dr. C. N. Dowd..... 54
Chirurgicale, La cure d'altitude et la cure solaire de la tuberculose.—Dr. Rollier..... 301
*Chirurgicaux de la tuberculine, Aspects.—Dr. R. W. Philip..... 203
*Chirurgie, über die Stellung des Tuberculins in der.—Dr. R. W. Philip..... 203
Chirurgische Behandlung der Lungen-Tuberkulose, die.—Prof. S. Sauerbruch..... 82
Codivilla, Dr. D. A.—Immobilization in Tuberculous Arthritis..... 129
Connell, Dr. G..... 310
Construction of Hospitals for Tuberculosis Patients.—Mr. M. J. Sturm 5
*Córnea, Tuberculosis de la.—Dr. Oscar Dodd..... 33
*Cornea, Tuberkulose der.—Dr. Oscar Dodd..... 34
Cornea, Tuberculosis of the.—Dr. Oscar Dodd..... 29
*Cornée, Tuberculose de la.—Dr. Oscar Dodd..... 33
Corwin, Dr. R. W..... 267
Cuguillère, Dr..... 123
Cuvelier, Dr..... 123

Dodd, Dr. Oscar.—Tuberculosis of the Cornea..... 29
Dowd, Dr. C. N.—Tuberculosis of the Cervical Lymph-nodes: Report on 275 Cases treated by Radical Extirpation..... 54
Discussions.....60, 72

*Abstract.

PAGE
Ear, Tubereular Disease of the.—Dr. C. J. Blake 35
Eisendrath, Dr. D.—The Acute Forms of Abdominal Tuberculosis 303
Esmonet, Dr. C.—A Study of Experimental Tuberculosis of the Testicle 323

Finney, Dr. J. M. T. 267
Frauenthal, Dr. H. W.—Rational Spinal Support 311
Discussion 256
*Frische Luft, combinirt mit Hyperämie, angewandt in der Behandlung complizirter Fälle von Knochentuberkulose bei Erwachsenen.—Dr. W. Meyer 218

Gallagher, Dr. F. W. 11
Generative Organs, Tuberculosis of the Female.—Dr. I. S. Stone 188
Genou, Deux formes particulières d'arthropathies tuberculeuses du.—Dr. Mauclaire 126
Gillette, Dr. A. J.—How the State of Minnesota cares for its Indigent Children suffering from Tuberculosis of the Bones and Joints 251

*Hanche, Arthrite tuberculeuse de la.—Dr. S. H. Weeks 109
Hartmann, Dr. H.—Surgical Forms of Intestinal Tuberculosis 183
Hip Disease by Weight Bearing and Fixation by the Lorenz Short Hip Spica, The Treatment of Tuberculous.—Dr. H. A. Wilson 111
Hip-joint, Tubercular Arthritis of the —Dr. S. H. Weeks 100
Hip-joint Disease, Treatment of.—Prof. F. Calot 148
Hotchkiss, Dr. L. W.—Tuberculosis of the Stomach, Liver, Gall-bladder, and Pancreas 289
*Huesos y de las Articulaciones, Como el Estado de Minnesota Cuida por los Niños Indigentes Afectados de Tuberculosis de los.—Dr. A. J. Gillette 255
*Huesos y de la Tuberculosis Articular, Obliteración de las Cavidades delos, por Medio de la Pasta de Mosetig.—Dr. Nové-Josserand 142
*Hüftenerkrankungen mit Lastentragen, und Fixation mit Lorenz'scher Hüften-Spica, die Behandlung von tuberculösen.—Dr. H. A. Wilson 116

PAGE
*Hüftgelenks, tuberculöse Arthritis des.—Dr. S. H. Weeks 109
Hunner, Dr. Guy L. 172

Illyes, Dr. G. von.—Uber die Nierentuberkulose 315, 1
*Immobilisation dans l'arthrite tuberculeuse, Importance de l'.—Dr. A. Codivilla 137
Immobilization in Tuberculous Arthritis.—Dr. A. Codivilla 129
*Immovilizacion en la Artritis Tuberculosa, Importoncia de la.—Dr. A. Codivilla 135
Intestinal Tuberculosis, Surgical Forms of.—Dr. H. Hartmann 183

Josserand, Dr. Nové.—De l'oblitération des cavités osseuses et articulaires tuberculeuses avec la pâte de Mosetig 1, 140

Karo Dr. Wilhelm 1
Blasentuberkulose 157
Discussion 175
*Kehlkopfes, Tuberculose des: die der Heilung zugängliche Form derselben und deren Behandlungs-Prinzipien.—Dr. W. E. Casselberry 24
Kidney, Tuberculosis of the.—Dr. A. D. Bevan 176
*Kidney, Tuberculosis of the.—Dr. B. von Rihmer 321
*Kidneys, Tuberculosis of the.—Dr. G. von Illyes 315
*Knee, Two special Forms of Tuberculous Arthropathy of the.—Dr. Mauclaire 128
*Kniees, zwei besondere Formen von tuberkulöser Arthropathie des.—Dr. Mauclaire 127
*Knochen- und Gelenkshöhlen durch die Mosetig Paste, Obliteration von tuberkulösen.—Dr. Nové-Josserand 142
Korsell, Dr. 175
Kyle, Dr. D. B.—The Surgical Treatment of Tubercular Lesions of the Upper Respiratory Tract 40

*Laringe, Tuberculosis de la: Casos Capaces de Recuperar.—Dr. W. E. Casselberry 23
*Larynx, Tuberculose du: le Type Susceptible de Guérison.—Dr. W. E. Casselberry 24

PAGE

Larynx, Tuberculosis of the: The Type which is Capable of Recovery and the Principles of Treatment.—Dr. W. E. Casselberry..... 12
Lesions of the Upper Respiratory Tract, The Surgical Treatment of Tubercular.—Dr. D. B. Kyle..... 40
Lewis, Dr. Bransford.—Tuberculosis of the Bladder..... 165
Discussion..... 175
Lindahl, Dr. John..... 110
*Linfáticos Cervicales, Tuberculosis de los Nudos. Relato de 275 Casos Tratados por Medio de la Extripación Radical.—Dr. C. N. Dowd..... 58
Lower, Dr. W. E..... 175
Lund, Dr. F. C.—Tuberculosis of the Peritoneum..... 189
Lung and Pleura, Surgical Aspects of Tuberculosis of the.—Dr. S. Robinson..... 73
*Lungen und der Pleura, die Aussichten für chirurgische Behandlung der Tuberkulose der.—Dr. S. Robinson..... 80
*Lymphatiques cervicales, Tuberculose des glandes. Histoire de 275 cas traités par extripation radicale.—Dr. C. N. Dowd..... 58

Mauclaire, Dr.—Deux formes particulières d'arthropathies tuberculeuses du genou..... 126
Mayo, Dr. C. H., President's Address. 1
Discussion..... 59
Meyer, Dr. W.—Open-air and Hyperemic Treatment as Powerful Aids in the Management of Complicated Surgical Tuberculosis in Adults..... 212
Discussions.....110,174, 256
Mitchell, Dr. J. F.—Tuberculosis of Muscles, Tendons, and Fascia..... 279
Mosher, Dr. H. P.—Tuberculosis of the Nose, Mouth, and Pharynx... 43
Muscles, Tendons, and Fascia, Tuberculosis of the.—Dr. J. F. Mitchell.. 279
*Muscles, Tendons et Fascies, Tuberculose des.—Dr. J. F. Mitchell.. 288
*Muskeln, Sehnen, und Fascien, Tuberkulose der.—Dr. J. F. Mitchell. 288

*Nierentuberkulose, die Behandlung der.—Dr. T. Rovsing..... 278
Nierentuberkulose, über.—Dr. B. von Rihmer..... 318
Nierentuberkulose, über die.—Dr. G. von Illyes..... 315

PAGE

Nierman, Dr. H. G..... 310
Nose, Mouth, and Pharynx, Tuberculosis of the.—Dr. H. P. Mosher.... 43

Ochsner, Dr. E. H.—Vaccine Therapy in Joint Tuberculosis..... 117
Discussion..... 125
*Ojo, el Tratamiento Quirúrgico de las Enfermedades del—valor de la Prueba Oftalmica de la Tuberculina en.—Dr. C. A. Oliver..... 27
Oliver, Dr. C. A.—The Ophthalmo-tuberculin Test..... 26
Open-air and Hyperemic Treatment as Powerful Aids in the Management of Complicated Surgical Tuberculosis in Adults.—Dr. W. Meyer..... 212
*Orbitaires, le traitement chirurgical des maladies. La Valeur de la réactionophthalmo - tuberculine.—Dr. C. A. Oliver 27
Orbital Disease, A Brief Note upon the Value of the Ophthalmic-tuberculin Test in the Question of Surgical Tuberculosis of.—Dr. C. A. Oliver..... 26
*Oreille, La tuberculose de l'.—Dr. C. J. Blake..... 39
*Osseuse et articulaire, Comment l'état de Minnesota prend soin des enfants pauvres atteints de tuberculose.—Dr. A. J. Gillette..... 255
Osseuses et articulaires tuberculeuses avec la pâte de Mosetig, De l'oblitération des cavités.—Dr. Nové-Josserand..... 140

Painter, Dr. C. F.—Retroperitoneal Tuberculous Glands and their Relation to Spinal Symptoms.... 61
Peritoneum, Tuberculosis of the.—Dr. F. C. Lund..... 189
Philip, Dr. R. W.—Surgical Bearings of Tuberculin.....1, 199
President's Address.—Dr. C. H. Mayo. 1
*Pulmones y de la Pleura, Los Aspectos Quirúrgicos de la Tuberculosis de los.—Dr. S. Robinson..... 78

*Quirúrgica, El Tratameinto al aire Libre de la Tuberculosis.—Dr. De Forest Willard..... 266
*Quirúrgicos, La Tuberculina en los Casos.—Dr. R. W. Philip..... 203

*Rénal, Traitement de la tuberculose.—Dr. T. Rovsing..... 277

PAGE

*Renal, Tratamiento de la Tuberculosis.—Dr. T. Rovsing..... 277
Retroperitoneal Tuberculous Glands and their Relation to the Spinal Symptoms.—Dr. C. F. Painter.... 61
Rihmer, Dr. B. von.—Über Nierentuberkulose..... 318
*Riñones, Tuberculosis de los.—Dr. B. von Rihmer..... 322
Robinson, Dr. S.—Surgical Aspects of Tuberculosis of Lung and Pleura. 73
Rodman, Dr. Wm. L.—Tuberculosis of the Breast..... 346
Roentgen Method in the early Recognition of Tuberculosis of Bones and Joints, The Value of.—Dr. Carl Beck..... 144
*Rogñons, Tuberculose des.—Dr. G. von Illyes..... 316
Rollier, Dr.—La cure d'altitude et la cure solaire de la tuberculose chirurgicale..... 301
Rovsing, Dr. Thorkild.—Tuberculosis of the Urinary Tract..... 268

Sala, Dr. E. M..... 59
Sauerbruch, Prof.—Die chirurgische Behandlung der Lungen-Tuberkulose..... 82
Schmidt, Dr. L. E..... 174
*Sinus tuberculeux, Traitement chirurgical des.—Dr. E. G. Beck..... 250
Sinuses and their Prevention, Surgical Treatment of Tuberculous.—Dr. E. G. Beck..... 219
Spinal Support, Rational.—Dr. H. W. Frauenthal..... 311
Stomach, Liver, Gall-bladder, and Pancreas, Tuberculosis of the.—Dr. L. W. Hotchkiss..... 289
Stone, Dr. I. S.—Tuberculosis of the Female Generative Organs..... 188
Sturm, Mr. Meyer J.—Construction of Hospitals for Tuberculosis Patients..... 5
Surgical Bearings of Tuberculin.—Dr. R. W. Philip..... 199
Surgical Tuberculosis, Outdoor Treatment of.—Dr. DeForest Willard... 257

PAGE

Taylor, Dr. T..... 124
Testicle, A Study on Experimental Tuberculosis of the. — Dr. C. Esmonet..... 323
Townsend, Dr. W. R..... 72
*Traitamiento por Medio de la Carga de Pesos y el Fijamiento al Espigón de la Cadera, de Lorenz.—Dr. H. A. Wilson..... 115

*Unbeweglichkeit bei tuberkulöser Arthritis, die Wichtigkeit der.—Dr. D. A. Codivilla..... 138
Urinary Tract, Tuberculosis of.—Dr. T. Rovsing..... 268

*Vaccinale dans la tuberculose articulaire, Thérapie.—Dr. E. H. Ochsner..... 121
*Vaccine-Behandlung bei Gelenks-Tuberkulose.—Dr. E. H. Ochsner 122
Vaccine Therapy in Joint Tuberculosis.—Dr. E. H. Ochsner..... 177
*Vacuna-terapia en la tuberculosis de las Articulaciones.—Dr. E. H. Ochsner..... 121
Vas, Epididymis, and Testicle, Tuberculosis of the.—Dr. J. B. Walker.. 149
*Vejiga, Tuberculosis de la.—Dr. W. Karo..... 163
*Vessie, Tuberculose de la.—Dr. W. Karo..... 164

Walker, Dr. J. B.—Vas, Epididymis, and Testicle, Tuberculosis of the.. 149
Weeks, Dr. S. H.—Tubercular Arthritis of the Hip-joint..... 100
Whitbeck, Dr. B. H..... 256
Willard, Dr. DeForest.—Open-air Treatment of Surgical Tuberculosis..... 257
Discussions.....124, 267
Wilson, Dr. H. A.—The Treatment of Tuberculous Hip Disease by Weight Bearing and Fixation by the Lorenz Short Hip Spica.. 111
Discussion..... 125

Index to Volume II, Section IV.

PAGE

Abdominal Tuberculosis in Great Britain and the United States, The Relative Frequency of in Children.—Dr. David Bovaird, Jr.. 446
*Abdominal tuberculosis, La frecuencia de, en la Gran Bretaña y los Estados Unidos.—Dr. David Bovaird, Jr..... 453
L'Air confiné et de la tuberculose, de.—M. A. Rey..... 534
*Albuminuria of Childhood, Intermittent, Considered in its Relation to Hereditary Tuberculosis.—Dr. J. Teissier..... 477
*Albuminurie in der Kindheit in ihren Beziehungen zu erblicher Tuberkulose betrachtet, intermittierende. —Dr. J. Teissier..... 477
Albuminuries intermittentes de l'enfance considérées dans leurs relations avec l'hérédité tuberculeuse, Des.—Dr. J. Teissier..... 473

Barnes, Dr. N. P.—Hygiene of Mouth, Nares, Pharynx, Intestine, Skin, Mucous Membrane in General, of Lymph Bodies and Lungs; Prevention of Colds..... 671
*Bauchtuberkulose in Grossbritannien und den Vereinigten Staaten, relative Häufigkeit von.—Dr. David Bovaird, Jr..... 452
Bäumel, Dr. A.—Ein Resolutionsvorschlag..... 603
Bello, Dr. M. J.—Higiene Escolar en el Ecuador..... 537
Bovaird, Dr. David, Jr.—The Relative Frequency of Abdominal Tuberculosis in Children in Great Britain and the United States..... 446
Discussion..... 513
Bowditch, Dr. H. I.—A Clinical Study of the Transmission and Progress of Tuberculosis in Children Through Family Association..... 493
Bradstreet, Mr. H.—Relation of Tuberculosis to Parks and Playgrounds..... 619

PAGE

Brannan, Dr. J. W.—Seashore and Fresh-air Treatment at Sea Breeze Hospital..... 682
Breast-milk, The Opsonic Content of. —Dr. W. J. Butler..... 390
Butler, Dr. Wm. J.—The Opsonic Content of Breast-milk..... 390

Calmette's Ophthalmic Reaction to Tuberculin, The Value and Reliability of, for the Diagnosis of Tuberculosis and Differentiation of Tuberculous Lesions from other Diseases in Infants and Young Children.—Dr. E. M. Sill..... 542
Carpenter, Dr. H. C.—Tuberculous Pulmonary Cavities in Infants.... 434
Cavities, Tuberculous Pulmonary, in Infants.—Drs. C. Y. White and H. C. Carpenter..... 434
Chapin, Dr. H. D.—Recent Tests in the Diagnosis of Tuberculosis in Children at the New York Post-Gradate Medical School and Hospital..... 575
Children of the Tuberculous.—Dr. T. Sachs..... 479
Children of Tuberculous Parents, The Occurrence of Pulmonary Tuberculosis in.—Dr. J. A. Miller.... 487
Children, Recent Tests in the Diagnosis of Tuberculosis in, at the New York Post-Graduate School and Hospital.—Dr. H. D. Chapin and Dr. T. H. Coffin..... 575
Children's Gardens in Congested Neighborhoods for those Children with a Tendency to Tuberculosis, or for those in whom the Disease has been Arrested or Cured, The Value of.—Mrs. H. G. Parsons.... 608
Children, Tuberculosis in, particularly with Reference to Tuberculosis of the Lymphatic Glands and its Importance in the Invasion and Dissemination of the Disease.— Dr. T. Shennan..... 367
Clinical Manifestations of Tuberculous Meningitis.—Dr. D. J. McCarthy and Dr. C. A. Fife..... 399

*Abstract.

PAGE

Coffin, Dr. T. H.—Recent Tests in the Diagnosis of Tuberculosis in Children at the New York Post-Graduate Medical School and Hospital. 575
Comby, Dr. J.—Rôle de la contagion humaine dans la tuberculose infantile..... 503
Copeland, Dr. E. P.—The Relation of Measles, Whooping-cough and Influenza to Tuberculosis in Childhood..... 379
Craig, Dr. F. A.—The Prognosis in Pulmonary Tuberculosis in Children under Fifteen years of age.... 652
Cronin, Dr. J. J.—Obstructive Abnormalities of the Nose and Throat: Predisposing Factors to Tuberculosis in School Children..... 515
Cutaneous and Ophthalmic Tuberculin Tests in Infants under Twelve Months of Age.—Dr. H. L. K. Shaw..... 547

*Diagnose der Tuberkulose im Säuglingsalter und in der Kindheit durch die Hautinoculation von Tuberkulin.—Dr. L. Fischer..... 587
Diagnosis of Tuberculosis in Infancy and Childhood by means of the Inoculation of Diluted Tuberculin or Pure Tuberculin, An Aid to.—Dr. L. Fischer..... 581
*Diagnostico de la Tuberculosis en la Ninez por Medio de las Inoculaciones Cutaneas de la Tuberculina Diluida.—Dr. L. Fischer..... 586
*Distribution des lésions tuberculeuses chez les bébés et chez les petits enfants; Étude fondée sur autopsies.—Dr. M. Wollstein..... 433
Distribution of Tuberculous Lesions in Infants and young Children, The; A Study based upon Post-mortem Examination.—Dr. M. Wollstein..... 423

*Enfants des tuberculeux, Les.—Dr. T. Sachs..... 485
*Enfants, La tuberculose chez les; Surtout celle des glandes lymphatiques.—Dr. T. Shennan..... 377
*Enfermadades, Sarampion, Tos Ferina é Influenza con la tuberculosis, La Relacion de las Infecciosas.—Dr. E. P. Copeland..... 383
*Examen obligatoire dans les crèches, écoles, orphelinats, etc.—Dr. A. Bäumel..... 607
*Examen Obligatorió en los Planteles, Escuelas, Asilos de Huerfanos, etc.—Dr. A. Bäumel..... 607

PAGE

*Examination and Treatment in Nurseries, Asylums, etc., Compulsory.—Dr. A. Bäumel..... 606
Expectant Treatment of Pulmonary Tuberculosis, The, A contribution from Orthopedic Surgery to the Study of Tuberculosis.—Dr. A. B. Judson..... 676

*Familia, Association con la; Transmición y el Progreso de la Tuberculosis en los Niños por Medin de la.—Dr. C. Floyd y Dr. H. I. Bowditch..... 501
*Famille, La transmission et le progrès de la tuberculose chez les enfants par les rapports dans la.—Dr. C. Floyd et Dr. H. I. Bowditch..... 502
Family Association, A Clinical Study of the Transmission and Progress of Tuberculosis in Children through.—Dr. C. Floyd and Dr. H. I. Bowditch..... 493
Fetra, Dr. L. E. La.—Tuberculosis in Infants..... 361
Fife, Dr. C. A.—Clinical Manifestations of Tuberculous Meningitis... 399
Fischer, Dr. L.—An Aid to the Diagnosis of Tuberculosis in Infancy and Childhood by Means of the Cutaneous Inoculation of Diluted Tuberculin or Pure Tuberculin.... 581
Floyd, Dr. C.—A Clinical Study of the Transmission and Progress of Tuberculosis in Children through Family Association..... 493
*Fréquence de la tuberculose chez les enfants.—Dr. C. von Pirquet.. 566
Frequency of Tuberculosis in Children—Dr. C. von Pirquet..... 559

Goodall, Dr. H. S..... 512
Green, Dr. E. M.—Report of a Case of Miliary Tuberculosis, probably of Bovine Origin, in a Child aged Four and One-half Months..... 394

Hamill, Dr..... 514
*Häufigkeit der Tuberkulose im Kindesalter.—Dr. C. von Pirquet.. 567
Heiman, Dr. H.—Clinical Observations on the von Pirquet Reaction in Children..... 569
*Higienica y Climatologica, La Profilatis de la Tuberculosis en la Ninez.—Dr. F. L. Wachenheim.... 634
Holt, Dr. L. E.—A Report upon One Thousand Tuberculin Tests in young Children..... 551

PAGE

Hutchinson, Dr. Woods.—The Localization of Tuberculosis in Children..... 417
Discussion..... 512
Hygiene of Mouth, Nares, Pharnyx, Intestine, Skin, Mucous Membrane in General; of Lymph Bodies and Lungs. Prevention of Colds.—Dr. N. P. Barnes..... 671
Hygienic and Climatic Prophylaxis of Tuberculosis in Children, The. —Dr. F. L. Wachenheim..... 623
*Hygienische und klimatische Prophylaxe der Tuberkulose in der Kindheit, die.—Dr. F. L. Wachenheim..... 633

*Infantil, El Contagio humano como factor en la Tuberculosis.—Dr. J. Comby..... 511
Infantile, Rôle de la contagion humaine dans la tuberculose.—Dr. J. Comby..... 503
*Infantile Tuberculosis, Human Contagion as a Factor in.—Dr. J. Comby..... 510
Infants, Tuberculosis in.—Dr. L. E. La Fetra..... 361
*Infectionskrankheiten — Masern, Keuchhusten und Influenza, zur Tuberkulose bei Kindern, die Beziehungen der.—Dr. E. P. Copeland.. 384

Jacobi, Dr. Abraham.—President's Address..... 355
Discussion..... 514
Judson, Dr. A. B.—The Expectant Treatment of Pulmonary Tuberculosis: A Contribution from Orthopedic Surgery to the Study of Tuberculosis..... 676

*Kindertuberkulose, menschliche Ansteckung als ein Factor in.—Dr. J. Comby..... 510
*Kinder tuberkulöser Eltern, die.—Dr. T. Sachs..... 486
*Kindern, besonders mit Rücksicht auf die Lymphdrüsen-Tuberkulose, Tuberkulose bei.—Dr. T. Shennan 378
*Kindern tuberkulöser Eltern, das Vorkommen der Lungentuberkulose bei.—Dr. J. A. Miller und Dr. I. O. Woodruff..... 492
*Klinischen Erscheinungen der tuberkulösen Gehirnhaut-Entzündung, die.—Dr. D. J. McCarthy und Dr. C. A. Fife..... 414

PAGE

Knopf, Dr. S. A.—Overcoming the Predisposition to Tuberculosis and the danger from Infection during Childhood..... 635
Kotz, Dr. A. L.—Report of a Case of Miliary Tuberculosis, probably of Bovine Origin, in a Child Aged Four and One-half Months..... 394

*Lait de femme; sur le pouvoir opsonique du. Recherche contre le bacille de la tuberculose.—Dr. W. J. Butler..... 393
*Leche Humana con Relación al Bacilo de la Tuberculosis, Investigación del Poder Opsónico de la.—Dr. W. J. Butler..... 393
Libman, Dr. E..... 597
Litchfield, Dr. Lawerence..... 415
*Localisation primaire de la tuberculose chez les enfants, La Dr. W. Hutchinson..... 422
Localization of Tuberculosis in Children.—Dr. W. Hutchinson..... 417
*Lombaire (piquûre) dans la méningite tuberculeuse des enfants, Valeur diagnostique de la.—Dr. F. E. Sondern..... 595
Lumbar Puncture in Acute Tuberculous Meningitis in Children, Diagnostic Value of.—Dr. F. E. Sondern..... 588
*Lumbarpunktion in acuter tuberkulöser Meningitis bei Kindern, der diagnostische Wert der.—Dr. F. E. Sondern..... 596
*Lumbar (Puntura) en la Meningitis Tuberculose Aguda de los Niños, El Valor Diagnóstico de la.—Dr. F. E. Sondern..... 595

*Manifestaciones Clinicas de la Meningitis Tuberculosa, Las.—Dr. D. J. McCarthy y Dr. C. A. Fife..... 412
*Manifestations cliniques de Méningite tuberculeuse.—Dr. D. J. McCarthy et Dr. C. A. Fife..... 413
McCarthy, Dr. D. J.—Clinical Manifestations of Tuberculous Meningitis.. 399
Measles, Whooping-cough, and Influenza, The Relation of, to Tuberculosis in Childhood.—Dr. E. P. Copeland..... 379
Medin, Prof. O.—On von Pirquet's Cutaneous Tuberculin Test on Children in the First Year of Infancy..... 385
Meeresufer, die Behandlung am, und in der freien Luft in dem Sea Breeze

PAGE

Hospital für tuberkulöse Krankheiten der Knochen, Gelenke und Drüsen.—Dr. J. W. Brannan..... 702
*Mer, Le traitement à l'air de la, et à l'air pur, employé â l'hopital "Sea Breeze," pour les cas de tuberculose des os, des articulations et des glandes chez les enfants.—Dr. J. W. Brannan..... 701
Meyer, Dr. Willy.—The Possibility of Avoiding Conspicuous Scar Formation in Softened Tuberculosis of the Cervical Glands..... 703
Miliary Tuberculosis, probably of Bovine Origin, in a Child Aged Four and a Half Months, Report of a Case of.—Dr. E. M. Green and Dr. A. L. Kotz..... 394
Miller, Dr. J. A.—The Occurrence of Pulmonary Tuberculosis in Children of Tuberculous Parents..... 487
*Muttermilch für Tuberkelbazillen, Prüfung der opsonischen Kraft der.—Dr. W. J. Butler..... 393

*Niños, con Referencia, en Particular, á la Tuberculosis de las Glandus Linfaticas, Tuberculosis en los.—Dr. T. Shennan..... 376
*Niños de los Tuberculosos, Los.—Dr. T. Sachs..... 485
*Niños de Padres Tuberculosos, Tuberculosis Pulmonar en los.—Dr. J. A. Miller y Dr. I. O. Woodruff.....491
*Niños, un Analisis de 130 Casos en el Hospital con Relación a la Etiologia, y el Diagnóstico la Prevención y el Tratamiento, Tuberculosis en los.—Dr. L. E. La Fetra .. 366

Obstructive Abnormalities of the Nose and Throat. Predisposing Factors to Tuberculosis in School Children.—Dr. J. J. Cronin..... 515
*Oftalmica, Prueba, de Calmette en los Enfernedades de los Niños, El Valor de la.—Dr. E. M. Sill..... 546
*Ophthalmique, Réaction, Sa valeur pour le diagnostic chez les nourrissons et les jeunes enfants.—Dr. E. M. Sill..... 546
*Ophthalmo-Reaktion für die Diagnose von Krankheiten bei jungen Kindern, der Wert und die Anwendbarkeit von Calmettes.—Dr. E. M. Sill..... 546
*Orthopädischen Chirurgie zum Studium der Tuberkulose, ein' Beitrag aus der.—Dr. A. B. Judson.....681

PAGE

*Orthopédique a l'étude de la tuberculose, Une contribution de la chirurgie.—Dr. A. B. Judson..... 680
Ortopedia Quirurgica al Estudio de la Tuberculosis, Contribución de la.—Dr. A. B. Judson..... 680

Parks and Playgrounds, Relation of Tuberculosis to.—Mr. H. Bradstreet..... 619
Parsons, Mrs. H. G.—The Value of Children's Gardens in Congested Neighborhoods for those Children with a tendency to Tuberculosis, or for those in whom the Disease has been Arrested or Cured..... 608
Péhu, M.—La péritonite tuberculeuse du nourrisson..... 454
Pericardium in Children, Tuberculosis of the.—Dr. J. S. Wall..... 464
Péritonite tuberculeuse du nourrisson, La.—M. E. Weill et M. Péhu.. 454
von Pirquet Reaction in Children, Clinical Observations on the.—Dr. H. Heiman..... 569
von Pirquet, la Reacción de en los Niños, Algunas observaciones Clínicas Sobre.—Dr. H. Heiman..... 572
*von Pirquet, la réaction de, chez les enfants, Quelques observations cliniques sur.—Dr. H. Heiman.... 573
*von Pirquet'schen Reaktion bei Kindern, einige klinische Beobachtungen bei der.—Dr. H. Heiman 573
Pirquet, Dr. C. v.—Frequency of Tuberculosis in Children..... 559
*Placenta, Transmission de la Tuberculose par le.—Dr. A. S. Warthin.. 531
*Placenta, Transmision de la Tuberculosis por Medio de la.—Dr. A. S. Warthin..... 529
Placental Transmission of Tuberculosis.—Dr. A. S. Warthin..... 524
*Placentar-Übertragung der Tuberkulose, die.—Dr. A. S. Warthin... 532
Predisposition to Tuberculosis and the Dangers from Infection during Childhood, Overcoming the.—Dr. S. A. Knopf..... 635
Préservation de l'Enfance contre la tuberculose, Oeuvre de la Section Lyonnaise.—Dr. Edmund Weill.. 648
President's Address.—Dr. A. Jacobi.. 355
*Prognose der Lungenschwindsucht bei Kindern unter dem fünfzehnten Lebensjahre.—Dr. F. A. Craig.... 670
*Prognosis de la Tuberculosis Pulmonar en los Niños Menores que Quince Años.—Dr. F. A. Craig.... 669

PAGE

Prognosis in Pulmonary Tuberculosis in Children under Fifteen Years of Age, The.—Dr. F. A. Craig.... 652
*Pronostic dans la tuberculose pulmonaire chez les enfants audessous de quinze ans.—Dr. F. A. Craig... 669

Resolutionsvorschlag, ein.—Dr. A. Bäumel..... 603
Rey, M. A.—De l'air confiné et de la tuberculose..... 534
Rist, Dr..... 512

Sachs, Dr. T.—Children of the Tuberculous..... 479
Scar Formation in Softened Tuberculosis of the Cervical Glands, The Possibility of Avoiding Conspicuous.—Dr. W. Meyer..... 703
School Children, An Expeditious Method for the Detection of Tuberculosis among.—Dr. H. Shoemaker.. 589
Schools, Open-air.—Mrs. A. G. Spencer..... 612
Seashore and Fresh-air Treatment at Sea Breeze Hospital.—Dr. J. W. Brannan..... 682
Shaw, Dr. H. L. K.—The Cutaneous and Ophthalmic Tuberculin Tests in Infants under Twelve Months of Age..... 547
Shennan, Dr. T.—Tuberculosis in Children..... 367
Shoemaker, Dr. H.—An Expeditious Method for the Detection of Tuberculosis among School Children.. 598
Sill, Dr. E. M.—The Value and Reliability of Calmette's Ophthalmic Reaction to Tuberculin..... 542
Sondern, Dr. F. E.—Diagnostic Value of Lumbar Puncture in Acute Tuberculous Meningitis in Children.. 588
Spencer, Mrs. A. G. — Open-air Schools..... 612

PAGE

Teissier, Dr. J.—Des albuminuries intermittentes de l'enfance considérées dans leurs relations avec l'hérédité tuberculeuse..... 473
Tuberculin Tests in Young Children, A Report upon One Thousand.—Dr. L. E. Holt..... 551
*Tuberculose milaire chez un enfant de 4 mois et demi. Rapport de l'autopsie.—Dr. E. M. Green et Dr. A. L. Kotz..... 397
*Tuberculosis miliaria en un niño de cuatro meses y medio de edad. Informe sobre la autopsia.—Dr. E. M. Green y Dr. A. L. Kotz..... 398

*Verteilung tuberkulöser Verletzungen bei Säuglingen und jungen Kindern, die; eine Studie auf Grund von Autopsien.—Dr. M. Wollstein..... 432
von Pirquet's Cutaneous Tuberculin Test in Children in the First Year of Infancy, On.—Dr. O. Medin.... 385

Wachenheim, Dr. F. L.—The Hygienic and Climatic Prophylaxis of Tuberculosis in Childhood..... 623
Wall, Dr. J. S.—Tuberculosis of the Pericardium in Children..... 464
Warthin, Dr. A. S.—The Placental Transmission of Tuberculosis..... 524
Weill, M. E.—Oeuvre de la préservation de l'enfance contre la tuberculose.—Section Lyonnaise.. 648
La péritonite tuberculeuse du nourrisson..... 454
White, Dr. C. Y.—Tuberculous Pulmonary Cavities in Infants..... 434
Wollstein, Dr. M.—The Distribution of Tuberculous Lesions in Infants and young Children..... 423
Woodcock, Dr. H. D..... 513
Woodruff, Dr. I. O.—The Occurrence of Pulmonary Tuberculosis in Children of Tuberculous Parents.. 487

COLUMBIA UNIVERSITY LIBRARIES

This book is due on the date indicated below, or at the expiration of a definite period after the date of borrowing, as provided by the rules of the Library or by special arrangement with the Librarian in charge.

DATE BORROWED	DATE DUE	DATE BORROWED	DATE DUE

C28(1140)M100

COLUMBIA UNIVERSITY LIBRARIES
0062038869

International congress on
Tuberculosis. 6th Washington.
v.2 Section 3-4 1908
6/12/42 13